JUNE
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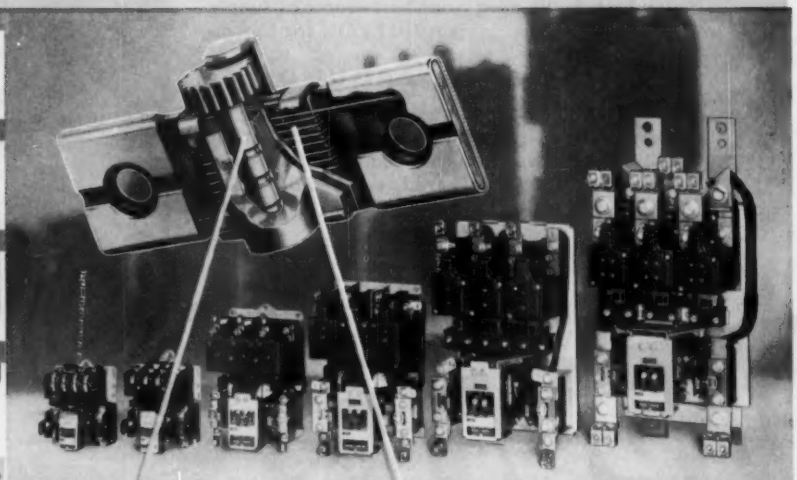

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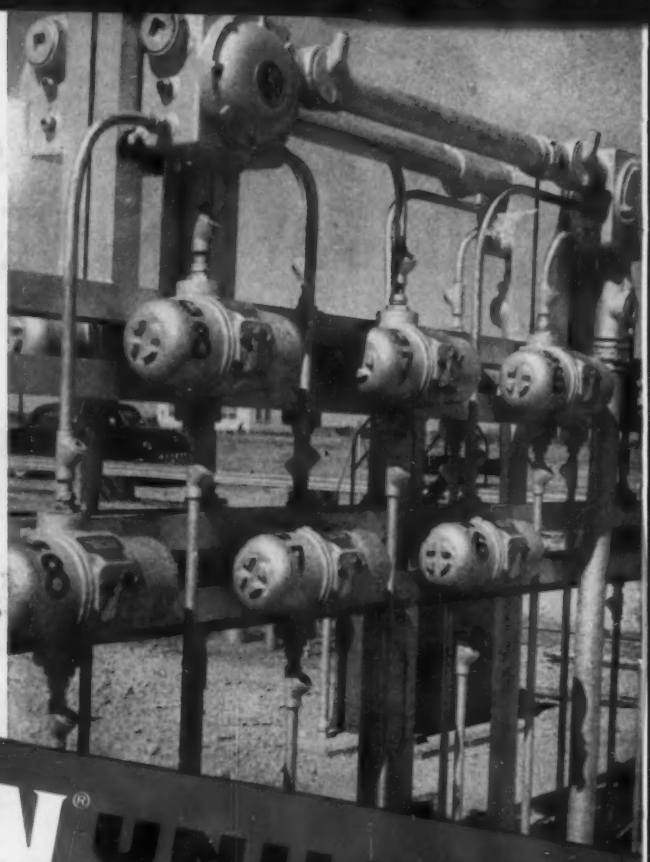

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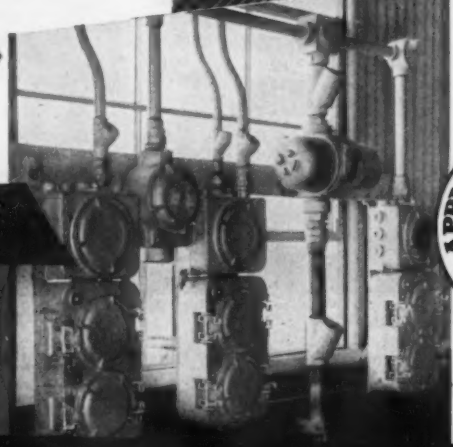

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Published monthly with an additional issue in September by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder. Executive, Editorial, Circulation and Advertising Offices: **McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y.** See panel below for directions regarding subscriptions or change of address. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Officers of the McGraw-Hill Publishing Co., Inc.: Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice-President; L. Keith Goodrich, Vice-President and Treasurer; John J. Cooke, Secretary; Officers of the Publications Division: Nelson L. Bond, President; Shelton Fisher, Senior Vice-President; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venezian, Vice-President and Circulation Coordinator.

Subscriptions are solicited only from persons engaged in electrical construction, maintenance or consulting services. **Position and company connection must be indicated on subscription orders.**

United States subscription rate for individuals in the field of the publication $3.00 per year. This issue 75 cents. Electrical Products Guide $2.50. Canada, $5.00 a year. All other countries, $15.00 a year, payable in advance. Second class postage paid at Albany, N.Y. Printed in U. S. A. Title registered in U.S. Patent Office.

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Sidelights

DOWN-FEED DISTRIBUTION

To provide maximum rentable floor space in the new Los Angeles Furniture Mart a novel electrical system design was developed. Switchgear and transformers were installed on the roof with feeders dropping through square ducts to panels on the floors below. Consulting Engineer C. J. Bennett describes the installation in "Down-Feed Distribution" beginning on page 78.

BIDDING

Even for the smaller contractor, sound procedures can take much of the guesswork out of bidding. Rowan C. Brooks of Rapid Electric Service, a professional estimating organization spells out the sequence of making a sale and how the contractor can appraise his own bidding practice in the first of a series of two articles beginning in this issue. "Bidding Doesn't Have to be Guesswork" begins on page 85.

TOOLS AND METHODS

As we go to press our big special report on up-to-date electrical construction, installation and maintenance job methods and tooling practice is in preparation for the July issue. Associate Editor August Eckel has packed this report with practical, job-tested ideas from current projects. Watch for this important editorial feature in the next issue.

APARTMENT MODERNIZATION

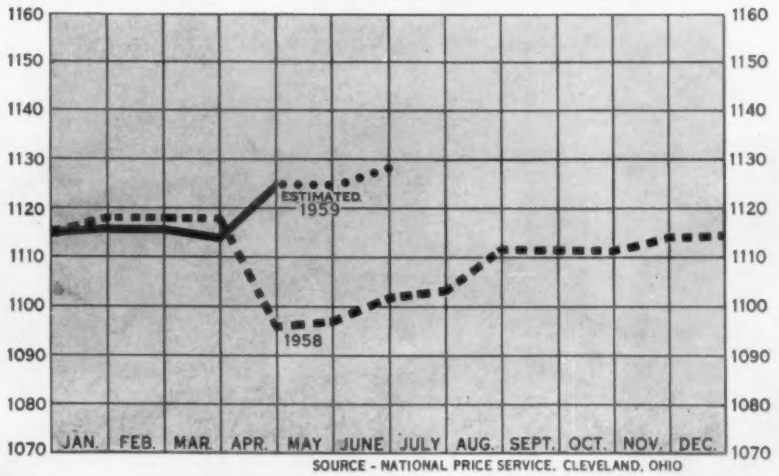
An electrical modernization project in a 17-story Chicago apartment building boosted electrical capacity by nearly 400%. To accomplish this with a minimum of inconvenience to the tenants the electrical contractor used a stair-well 480-volt riser system with step-down transformers and surface raceway circuit distribution through the corridors. Stanley C. Wielgos of Premier Electrical Construction Co. describes the details of the system in "High Rise Apartment Building Rewiring," beginning on Page 73.

HIGH BAY LIGHTING

Combining the economy of color-modified mercury lamps with new high-efficiency fluorescent lamps is an effective approach to high bay lighting application. Ward Harrison, Consulting Engineer of Cleveland, Ohio reviews the present status of high bay lighting practice in an article beginning on page 98.

ELECTRICAL MATERIALS COST INDEX

BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT THE VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.



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Washington Report

JUNE • 1959

Business recovery from the 1958 slump is firm, but its pace may be too fast, in the opinion of most Washington officials. They see a real boom in the making, and worry that inflationary pressures may increase. Also, the nation's top industrialists and Government officials who comprise the Commerce Department's Business Advisory Council, meeting in Hot Springs, Va. last month, were generally optimistic about business prospects through mid-1960, but predicted a temporary slowdown in the steady economic rise in case a steel strike develops this summer.

Industrial production has climbed sharply from last year's low, up 18% in twelve months, or from 126 (of 1947-49 average) in April 1958 to 149 during April of this year. Government purchase of goods and services with deficit dollars (an estimated $13 billion in this fiscal year, ending June 30) was a major factor, which will mostly disappear during the next 12 months if the President's balanced budget for fiscal 1960 is maintained, which now seems probable. Also, recent over-building of inventories by business, as a hedge against midyear strikes, has contributed.

A possible wage-price spiral this summer could weaken the economic upturn, in the opinion of both Government economists, and business leaders. Exports are already declining as high prices force American business out of world markets, and imports increase as foreign firms with lower wages outbid American firms for this nation's markets (small autos, cameras, toys, clothing, etc.). To meet this growing problem General Electric Board Chairman Ralph J. Cordiner last month presented an anti-inflation program to the Senate Antitrust subcommittee stressing reduced Federal spending and change of policy by labor unions.

Economic indicators continue to break records, confirm the business recovery. Typical examples: FRB industrial index for April was 149 (former record was 146 for April 1957); Personal income for April was $372.7 billion (old high was $365.4 billion in February 1959); Retail sales are now running at annual rate of about $215 billion, up from $200 billion in both 1957 and 1958; Construction for first quarter this year was $10.9 billion, a seasonally adjusted annual rate of $54.5 billion, contrasting with 1958's full-year record of $49 billion.

Electric power output in May was running about 12% ahead of year-earlier totals, EEI reported. Weekly outputs were of the order of 12.5 billion kwhr, with all geographic areas recording gains.

Electric lamp shipments during 1st quarter 1959 were up 10.5% over 1st quarter of 1958. Large incandescent lamp shipments totaled $48 million, and hot cathode fluorescent shipments totaled $25.1 million, Census Bureau reported, which compares with $44 million and $21.3 million, respectively, during the year-earlier similar period.

New construction activity in April reached a new high of $4.2 billion, up 18% from April 1958. Private construction totaled $2,918 million, as compared with $2,551 in April last year, due in large part to a 29% increase in residential building from the year-earlier figure. Public construction totaled $1,279 million, compared with $1,085 million in April 1958, with highway building showing a $95 million increase over the 12-month period.

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A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

One Battle We're Losing —And Why

Lest it seem self-serving, we of McGraw-Hill, as publishers, have hesitated to make the following statement about the "Battle of the Books." However, our reticence has been overcome by our conviction that it is greatly in the national interest to have much wider public understanding of the nature of this battle. This conviction is strengthened by the fact that many, not in the publishing industry, believe in the importance of this battle and, further, by the fact that it is a battle which the United States is losing.

The United States is losing an important battle — a battle of knowledge and ideas, waged with books. It does not have the excitement of competition in scientific achievement, nor the urgency of a diplomatic crisis, nor the obvious economic significance of a struggle for export markets. But our success or failure in this battle of knowledge and ideas may well have a decisive bearing on these more spectacular aspects of international rivalry.

The Russians know this. About a decade ago, they started a program to build up their export of books, the most durable and penetrating way of communicating knowledge and ideas. **By 1957 the Soviet Union was exporting 30 million books, one-and-a half times as many as the United States.** Many of these books are printed in English, and all are in languages of the non-Communist world.

In the languages of the Near East alone, the Russians printed and distributed 413,600 books in 1957, as compared with 166,415 in 1956. In India, Russian textbooks on engineering are to be published in English under a technical aid agreement signed in Moscow last December.

"Trade Follows The Book"

Books are in the advance guard of the Soviet political and economic challenge to the free world. With books go ways of thinking — about government, about education, about management, about science and technology. If these books do their job effectively in the training of those who will become a nation's leaders, they will provide the basis for political and cultural understanding and also, in the future, for trade.

The Russians are not the first to discover this relationship. Britain, which lives by trade, has traditionally exported more of its book production than any other nation. Today it exports one book in every two produced. The British have a favorite dictum: "Trade follows the book." They have proved its accuracy. Now the Russians are trying to make this same principle serve their purposes.

Where does the United States stand in this competition for men's minds? In number of books, it trails far behind the Soviet Union — exporting roughly 20 million books, against the Russians' 30 million. As a proportion of our total output of books, our exports amount to only 10% — against Britain's 50%.

The Russians' Advantage

U.S. book exports have grown in the years since World War II, from approximately $11,000,000 in 1946 to $35,000,000 in 1958 (both figures excluding Canada). But in expanding book exports, the American publishing industry faces two major obstacles:

(1) **The comparatively high cost of producing a book in the United States,** which puts its price well beyond the reach of many students, teachers and businessmen in other countries; and

(2) **The shortage of dollar exchange in many countries,** which means that importers can pay for

books only in currencies that are of little use to American publishers.

The Russians have neither of these problems. Soviet publishing is state-subsidized, and exported books are sold for nominal sums paid in the currencies of the importers. As these books serve the political and economic purposes of the Soviet Union, they are cheerfully sold on giveaway terms.

The American publishing industry, on its own, is making vigorous efforts to increase the distribution of American books in other countries. Leading U.S. publishers and their agents have offices and salesmen in the major countries of Asia, Africa and Latin America. Several publishers have begun to reprint textbooks in Asia at one-half to one-third of their U.S. costs, thus making them available to the students in Asian countries at prices they can more nearly afford. And the American paperback has become a symbol of low cost in popular books. But neither of these devices is practicable for serious cultural, technical, scientific, educational and professional books, which require durable, hard-bound and necessarily expensive editions. Despite their great importance to those who need these books, the demand for them is simply not large enough to warrant low-cost publishing methods.

Government agencies also have increased the availability of American books. The United States Information Agency and the International Cooperation Administration have placed American books in libraries overseas, donated them to educational institutions and presented them to key individuals in the industries and governments of the developing countries of the world. But these programs are small in relation to the need.

A Modest Program

An unusual and little-publicized Government program has helped American publishers overcome the other major obstacle to the export of books — the shortage of dollar exchange. This is the Informational Media Guaranty (IMG) program, administered by the United States Information Agency. It enables publishers of books judged to be worthy of the American way of life to sell their books, for local currency, in countries such as the Philippines, Formosa, Vietnam, Burma, Indonesia, Pakistan, Turkey, Israel, Poland, Yugoslavia, Spain and Chile, which would otherwise be unable to buy these books because of their shortage of U.S. dollar exchange.

The IMG program is not a giveaway. Publishers have to **sell** their books, and customers overseas have to want them enough to **buy** them at full prices. IMG merely guarantees that the exporting publisher receives in dollars the payments he collects from his customers in their currency. The program costs very little in terms of our total foreign aid program, or in terms of what it accomplishes. In ten years it has made possible the sale of $150 million worth of books, magazines and films to countries of key economic and strategic importance at a cost of only $10 million.

The IMG functions through a revolving fund. Foreign currencies are exchanged for dollars, and the foreign currencies in turn are resold to replenish the supply of dollars. The net cost is the small but unavoidable loss on resale of these foreign currencies. Over the ten years of this program, the IMG revolving fund has shrunk from its original $28 million to $18 million, $10 million of which is in unconverted foreign currencies.

If this modest but vitally important program is to be continued, Congress must appropriate the money necessary to rebuild the revolving fund. This would ensure that any country approved by the State Department and willing to sign an agreement to buy American books, at their full price, with its own currency, could do so. Last August, Congress reduced a requested appropriation for this purpose from $7 million to $2½ million. To continue even at its present reduced level, an appropriation of $3½ million is needed. To realize the full potential of IMG, the revolving fund must be restored to its original level.

If the IMG program is not continued, with adequate financial support, some countries whose friendship and understanding we seek today and with whom we hope to build a trading partnership in the future will have to reduce their purchases of American books to a trickle. These are countries where school teachers, college professors, students, engineers, doctors and businessmen need and want to buy American books. The loss will be not only theirs, but ours as well. For it will deprive the U.S. of one of its most effective, and least costly, means of communicating knowledge and ideas and understanding of the American way of life.

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The new Virden Commercial fixtures meet all present day standards for school lighting. Also ideal for offices, stores, commercial installations. Available in 2-light rapid start and slimline, 4 and 8 foot lengths. Also in 4-light tandems, rapid start, 8 foot lengths.

See them at your Virden distributors now! Or write for Form No. 146 to Virden Lighting, Dept. ECM, 5209 Euclid Ave., Cleveland 3, O.

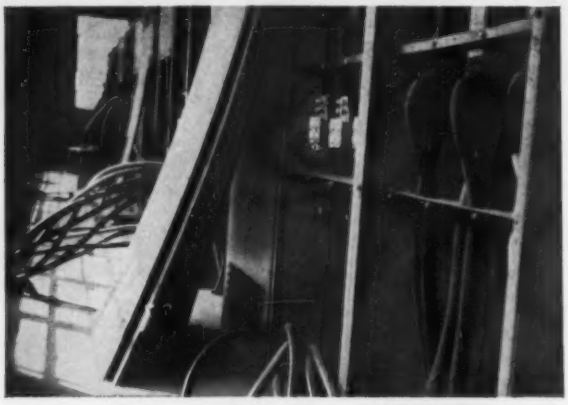
Find Your Nearest Dealer In The Yellow Pages

VIRDEN LIGHTING . . . Division of John C. Virden Company • Cleveland 3, Ohio

Member American Home Lighting Institute

Installed in underground ducts, Paranite Super Pararite-Paraprene® network cable services a modern electronic computer installation.

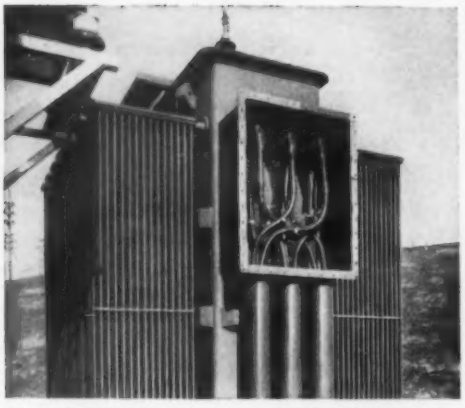
Paranite Super Pararite-Parasyn cables carry primary power between transformers and switchgear control panels in an ore reduction plant.



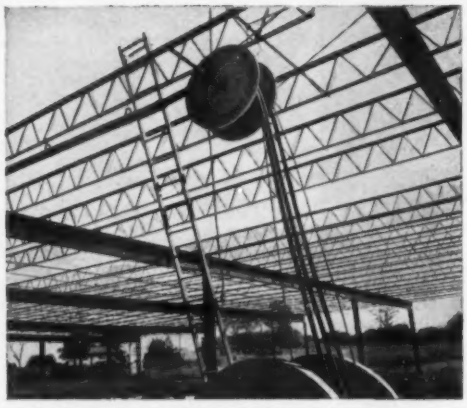
Across the nation for trouble-free installations...

PARANITE®

"IF IT'S PARANITE IT'S RIGHT"®



Paranite Super Pararite-Paraprene cable serves as the primary transformer feeder in a new municipal water pumping station.



Overhead duct installation of Paranite Super Pararite-Parasyn® (PVC) serves as a secondary feeder cable in a manufacturing plant.

The consistent selection and performance of Paranite cables from 600 volt network through 23,000 volt power cables mark them as products of close quality control. These Super Pararite-Paraprene and Super Pararite-Parasyn (PVC) cables illustrated above, indicate the versatility, national availability and proven trouble-free performance of Paranite installations.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne, Indiana

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Birmingham, Ala.; Anaheim, Calif. • Sales Offices in All Principal Cities

REG. U.S. PAT. OFF.

SCOTCHLOK BRAND Electrical Spring Connectors give tons of holding power...

fast one-step application

"SCOTCHLOK" Brand Connectors are the tightest gripping electrical wire connectors you can use—actually 50,000 psi of *permanent* holding power. They won't come loose or fall off! For all their strength, they are also compact, easily and quickly applied. Completely pre-insulated with unbreakable vinyl . . . long conforming skirt protects wire, prevents flash-over. You *know* the splice is tight because it *feels* right! Three sizes, each color-coded, enable you to pick the right connector quickly.

REG. U.S. PAT. OFF.

SCOTCHLOK BRAND

Electrical Spring Connectors

TYPE "Y" (Yellow) for fixtures: No. 12 to 18 AWG solid and stranded. **TYPE "R"** (Red) for general circuits: No. 10 to 16 AWG, solid and stranded. **TYPE "B"** (Blue) for heavy-duty industrial: No. 6 to 12 AWG, solid and stranded.

Send for FREE SAMPLES!

Tons of holding power in a fraction of an ounce!

See for yourself how tight the grip—how permanent the holding power! For samples of all three sizes, just write on your letterhead to 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. CB-69.

Made by the makers of "SCOTCH" Brand No. 33 Electrical Tape

"SCOTCHLOK" AND "SCOTCH" ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

"I learned—the hard way—that customers really want concealed telephone wiring!"

—SAYS BILL SMARTT, SMARTT CONSTRUCTION COMPANY, COLORADO SPRINGS, COLORADO

Builder Bill Smartt had offered concealed telephone wiring in his homes for years—until the recent recession came along. Then, as a small economy measure, he built 30 homes *without* this feature.

It didn't pay. "Right away, people started asking about telephone outlets and concealed wiring," says Bill. "Funny thing—I'd been sold on this idea for years, and now prospects were selling me on it all over again."

Smartt Construction Company has completed nearly 1500 homes since 1950—erected 52% of all the homes built in Colorado Springs during 1957. Today, they're building in the $13,500 to $15,000 range—in a scenic location in the shadow of Pike's Peak. Each unit has four built-in telephone outlets. Five outlets are planned for homes in a future development.

"People want concealed telephone wiring," says Bill Smartt. "So I'm giving it to them. It's an investment that pays off in more sales and more satisfied buyers."

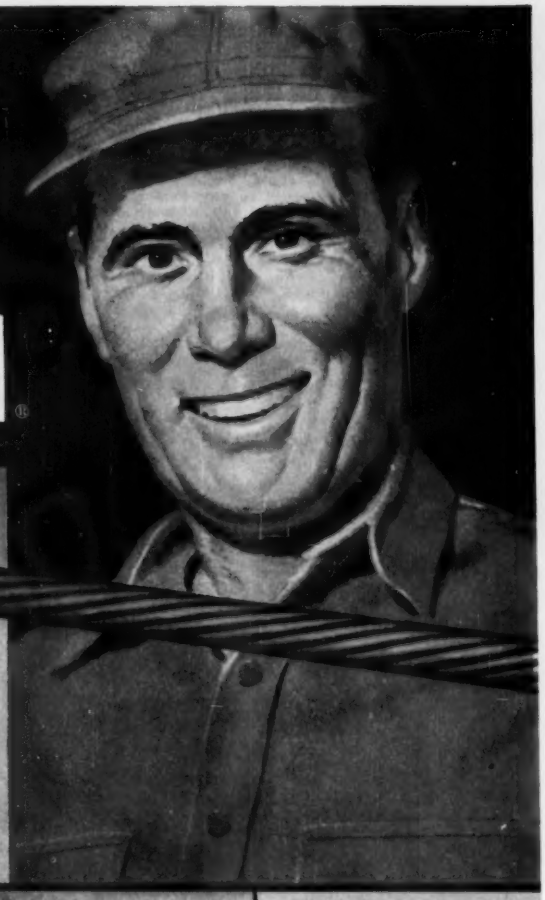
Bill Smartt discusses telephone outlets with Mountain States Telephone Company man Jim Edwards. One of the attractive Smartt homes is shown at left.

Your local Telephone Business Office will gladly help you with telephone planning for your homes. For details on home telephone installations, see Sweet's Light Construction File, 8i/Be. For commercial installations, Sweet's Architectural File, 32a/Be.

BELL TELEPHONE SYSTEM

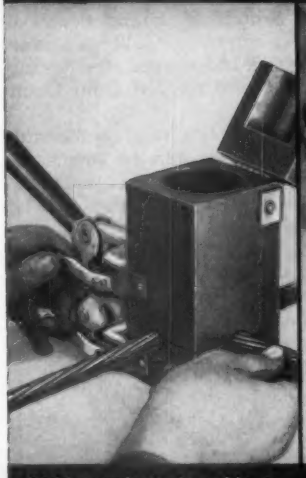
Now you can weld a perfect, permanent electrical connection every time with

BURNDY thermOweld®



. . . connects easily and economically to any copper conductor or steel structure

Get a permanent THERMOWELD connection quickly...never corrodes or loosens, costs little to install. Current-carrying capacity higher than conductors.

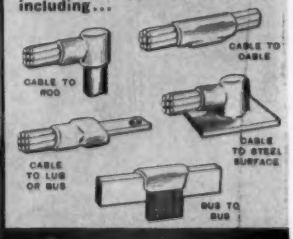


Weld anywhere, to cable or flat, with this compact, lightweight THERMOMOLD. Completely self-contained... needs no external source of power, no special skill.

Pour welding powder into mold, tap to release starting charge. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Slag easily removed.

Close cover and ignite charge with flint gun. Fast-burning powder fires every time. THERMOWELD reaction forms liquid copper which fuses conductors into a solid copper mass.

You can THERMOWELD almost all steel or copper connections, including...



THERMOWELD fires every time. Cartridges sealed in polyethylene envelopes with moisture absorbing silica gel. Starting, welding charges can't mix...full starting charge assures ignition.

All components are available from your local Burndy distributor. Ask him or your Burndy representative for a demonstration.

BURNDY

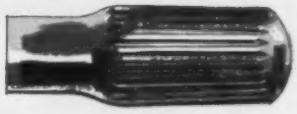
59-4

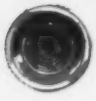
Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

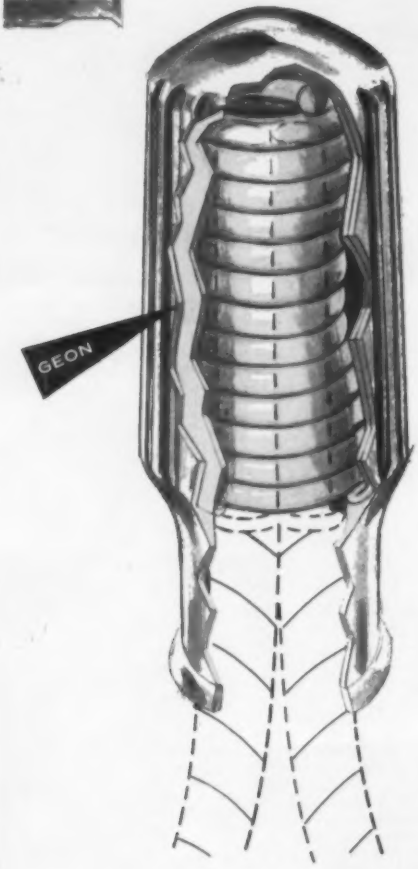
Another new development using

B.F.Goodrich Chemical *raw materials*

"Scotchlok" Brand electrical spring connectors, designed to give tons of holding pressure in a fraction of an ounce, are made by Minnesota Mining And Manufacturing Company, St. Paul, Minn., using caps molded of Geon by Minnesota Plastics Corporation, St. Paul. B.F.Goodrich Chemical Company supplies the Geon polyvinyl material.







High holding splices with a twist...

NEW CONNECTORS ARE CAPPED WITH GEON

Just three color coded sizes of this "Scotchlok" Brand electrical wire connector can splice over 400 wire combinations from 6 to 18 AWG solid and stranded. It consists of a bell-shaped steel spring in a hard steel shell, all fitted into a cap molded from Geon polyvinyl material.

Geon makes a tough and flexible cap. It has a long, conforming skirt to prevent flashover. And since Geon can be precision-molded, there is a knurled surface to provide finger grip, making it easier to twist the connector onto wire ends. Geon can also be molded in colors—each of the different sizes has its own color code.

Geon also provides ideal electrical characteristics. And it offers good resistance to abrasion, weathering, and heat, as well as non-flammability and low-temperature flexibility. In addition, Geon is inert to oil, chemicals and solvents.

The new U.L.-approved connector is providing permanent high-pressure splices for fixture and appliance applications, as well as for larger size wire in homes and industry. It's an example of the way that Geon makes possible new products, or new applications of existing ones. For more information, write Dept. AU-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

ALLIS-CHALMERS

The Profit Line for '59 **ALLIS-CHALMERS**

Exclusive electrical and manual stored-energy closing mechanism.

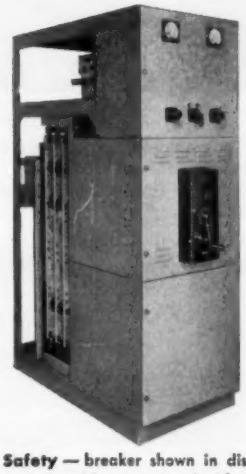
Convenience — control devices located on breaker front—safely available even with door closed.

Plus Value in every detail

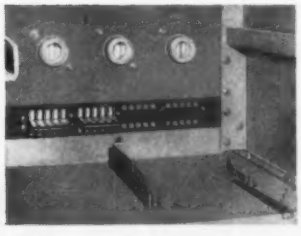
Allis-Chalmers all-new
600-volt metal-enclosed switchgear
for 75,000-ampere
interrupting service

Just a few of the operating . . . safety . . . and application features of A-C's new design are shown. There are many other features that will interest you, such as unitized construction, the use of polyester glass insulation, and spring-held dust seals.

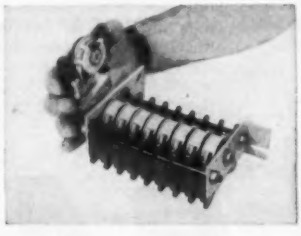
Get the details! Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



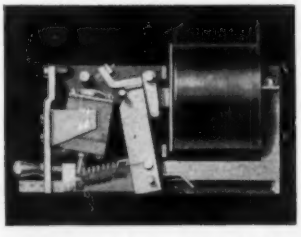
Safety — breaker shown in disconnected position . . . stored with door closed. The indicators show circuit breaker position.



Safety—*(a)* interlock prevents movement of closed breaker; *(b)* latch prevents rocking past disconnect position.



Flexibility—each stage of auxiliary switch assembly is individually adjustable without disassembly.



Accuracy — direct acting series-trip device is set easily, using calibration scale and adjusting knob.

A-C ALLIS-CHALMERS

A-1038-EC

ALLIS-CHALMERS

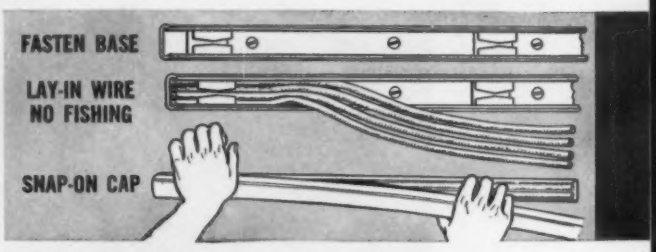
NATIONAL ELECTRIC

New! Better! Best!

Line-to-load products with exclusive features plus flexibility

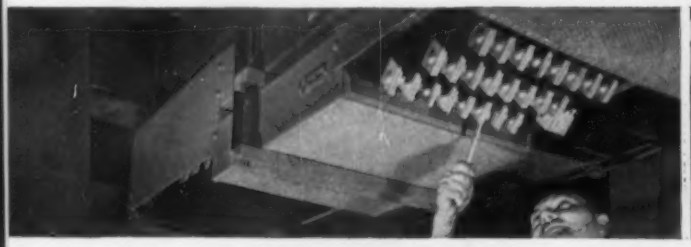
SHERARDUCT

Acid bath torture test proves superiority. Double protection: It's Sherardized (exclusive zinc process to galvanize in *depth*)! It's coated inside and out with MVC-1 (exclusive polyvinyl chloride resin that lasts and lasts)!



METAL MOLDING

Installation in a jiffy! Only one man to install. To maintain or add wiring, just snap off cover, repair, replace or add conductors —snap on cover. Flat, oval shape. Direct surface mounting. Attractive satin gray.

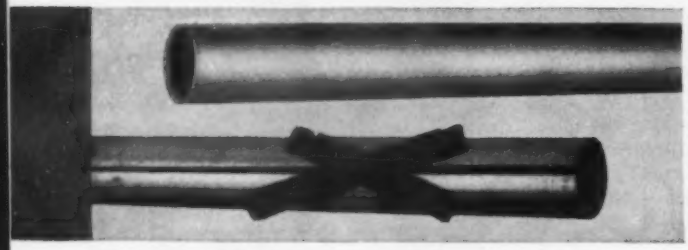


PLUG-IN AND LO-LOSS FEEDER BUSWAY

Lo-Loss busway has closely spaced bus bars for minimum voltage drop. Ratings to 4,000 amperes. Plug-in busway provides easy access to power along entire length of run. Ratings to 1500 amperes.

WROUGHT IRON CONDUIT

For corrosive areas. The only electrically-approved brand. Glass-like fibers in wrought iron create rust-impervious surface. Famous National Electric Sherardized *plus* MVC-1 vinyl coatings. Bends easily and uniformly.



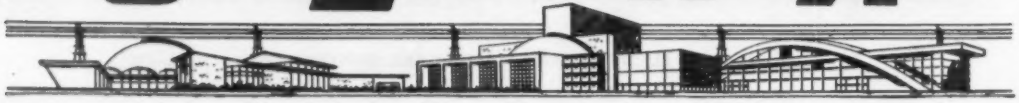
XDUCT JUNIOR

Quality control eliminates splits and high seams. E.M.T. with automated electronically-inspected production. Electrogalvanized outside surface. Aluminum enamel coating inside and out. Easy fishing. Superior bending. Silvery color.

PLUG-IN STRIP

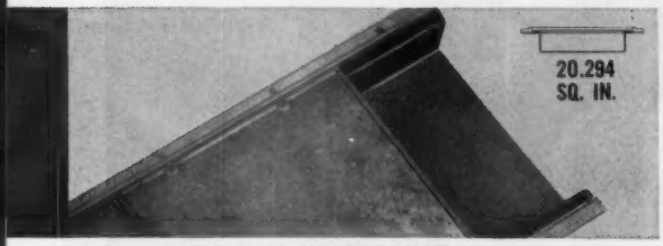
Outlets every 6" or 18". Solid copper electrical system from panel box to last outlet. Lifetime receptacles. No screws, splices or weldpoints to become loose. For kitchens, workshops, offices, stores, laboratories and factories.

POWER AHEAD



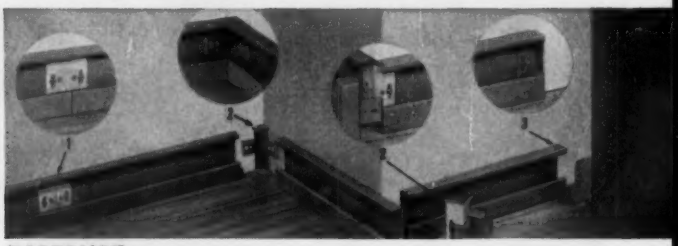
from National Electric

and capacity potential to meet tomorrow's power needs today!



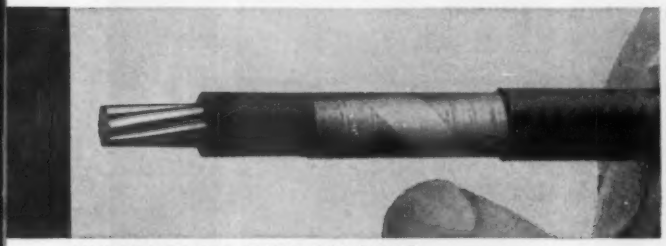
NEW! 15,000 SERIES HEADERDUCT

Largest available capacity. A full 20.294 square inches of wiring area. Provides 100% accessibility to any or all cells in cellular steel floors. Handles largest phone cables. A complete system for cellular floor construction.



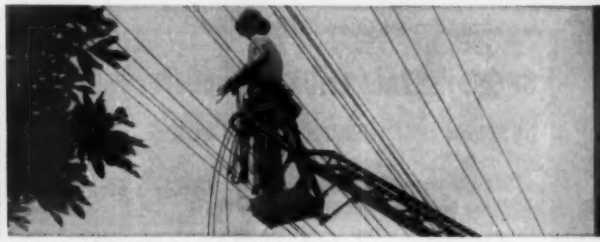
BASEDUCT

Saves up to 75% roughing time. Only 3 fittings needed, no screws, no welds. Multi-outlet surface raceway system for new or existing construction. Large, easy-access capacity for future wiring.



MYLAR* TAPED BUILDING WIRE

Four times the abrasion resistance of rubber-filled tape. Highly resistant to flexing. High dielectric strength. Withstands action of acids, alkalies, moisture, and oxidation. Smaller diameter. *Dupont "Mylar".

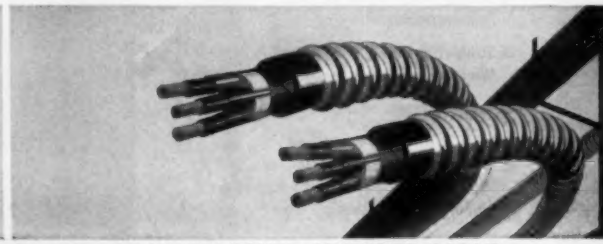


TUFFCOTE TELEPHONE WIRE

Three times longer service than bare or low-insulation lines. Eliminates costly tree-trimming and noisy circuits caused by "grounding" in windy, wet weather. Exclusive thermoplastic insulated wire easily spliced to conventional wire.

NEPCODUCT

New junction box is quickly brought into alignment with finished floor even after concrete has set. Leveling adjustment can be made with screwdriver without removing cover plate. Lazy susan interior partition can be relocated in case box should be inadvertently installed in incorrect position.



NEPCO-LOK INTERLOCKED ARMORED CABLE

Outstanding flexibility cuts installation costs. Installed quickly around corners and projections. Economically relocated for changing power needs of the future. 600-5,000 or 15,000 volt . . . one, two, three or four conductor assemblies.

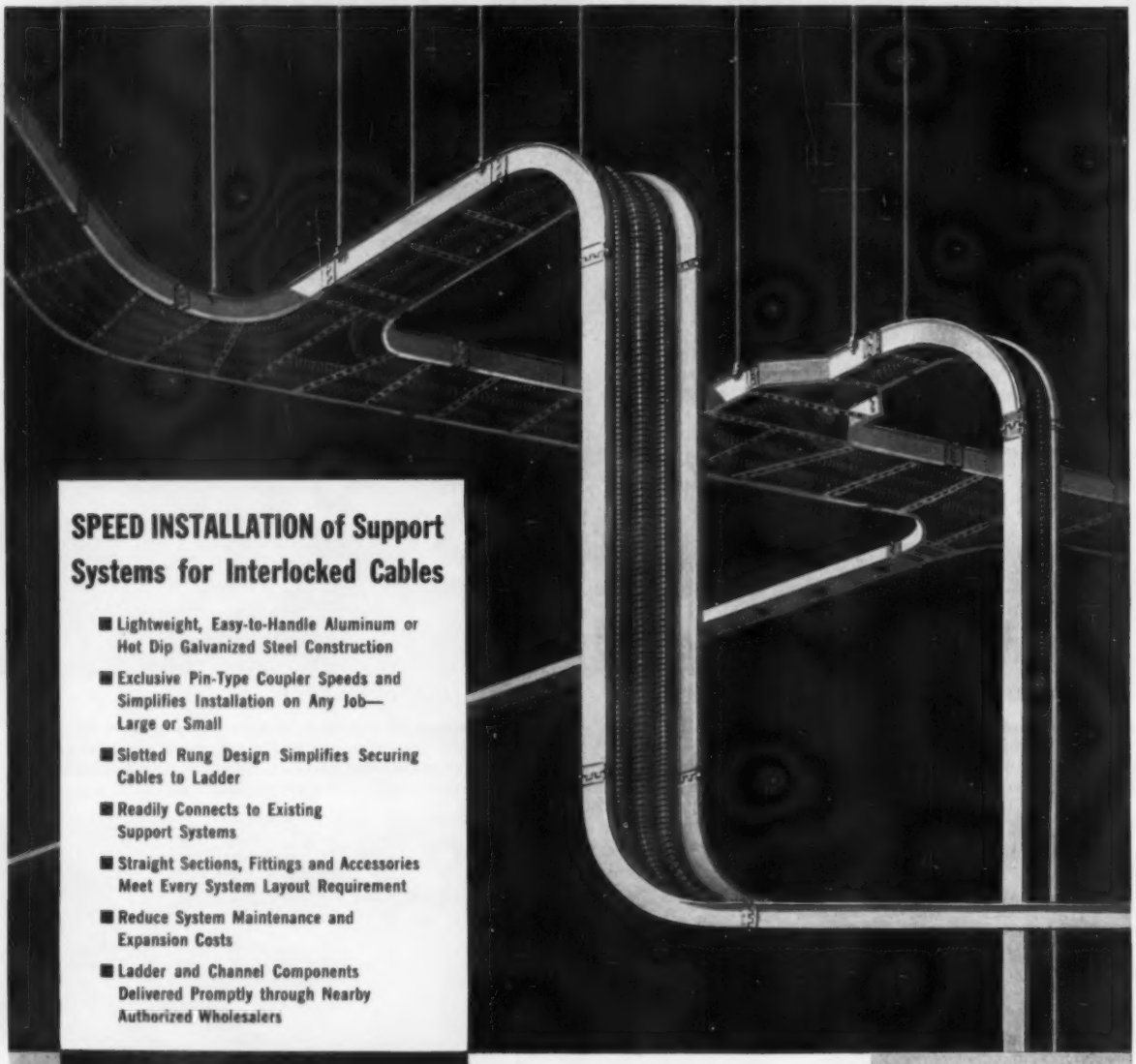
EXPERT APPLICATION ENGINEERING SERVICE AVAILABLE ON ALL PRODUCTS!

NATIONAL ELECTRIC DIVISION **PORTER** ***H.K. PORTER COMPANY, INC.***

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepraduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

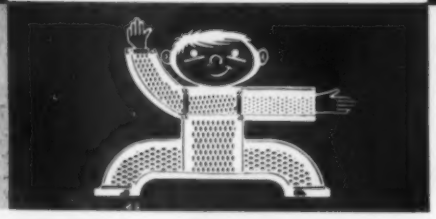
COPE LADDER and CHANNEL

FOR ARMORED CABLE DISTRIBUTION



SPEED INSTALLATION of Support Systems for Interlocked Cables

- Lightweight, Easy-to-Handle Aluminum or Hot Dip Galvanized Steel Construction
- Exclusive Pin-Type Coupler Speeds and Simplifies Installation on Any Job—Large or Small
- Slotted Rung Design Simplifies Securing Cables to Ladder
- Readily Connects to Existing Support Systems
- Straight Sections, Fittings and Accessories Meet Every System Layout Requirement
- Reduce System Maintenance and Expansion Costs
- Ladder and Channel Components Delivered Promptly through Nearby Authorized Wholesalers



ASK FOR PROOF! Speed your next job by getting details on Cope Ladder and Channel from your Authorized Cope Electrical Wholesaler today. For illustrated brochure describing system details, write direct to T. J. Cope, Division of Rome Cable Corporation, Collegeville, Pa.

COPE WIREWAY AND CHANNEL ARE SOLD ONLY THROUGH AUTHORIZED ELECTRICAL WHOLESALERS

1021

COPE

Originators of First Integrated Line of Cable Supporting Systems

WIREWAY • LADDER • CHANNEL • CONTROLWAY

Division of ROME CABLE CORPORATION

COLLEGEVILLE, PENNSYLVANIA

88A-T
⅛" to 2½"

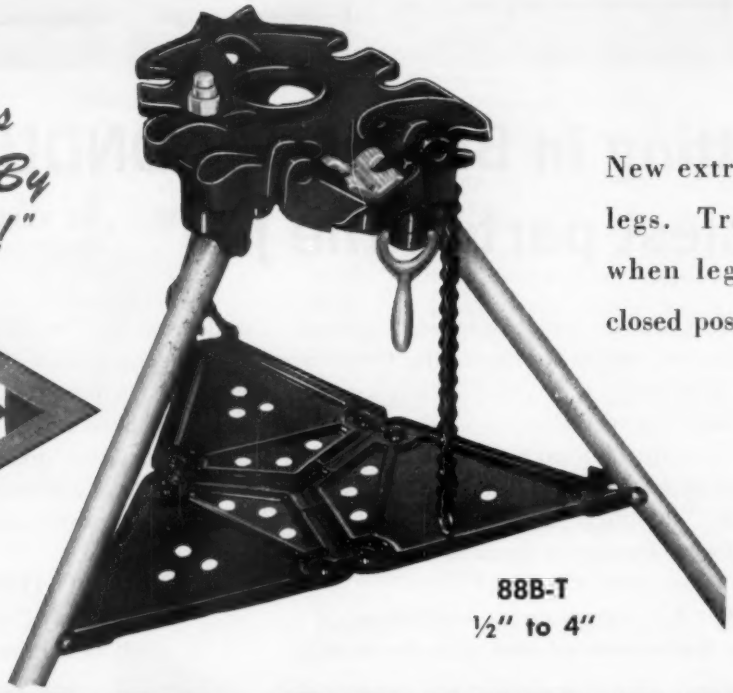
NEW COMBINATION VISE STAND WITH TRAY!

Designed so yoke parts ⅛" to 2½" can be replaced by chain vise parts ½" to 4" on the same base in a matter of minutes.

NYE Stands have double socket efficiency benders for ½" and ¾" pipe, also slots for holding tools. Ceiling brace screw for added rigidity. Hole in rear of base is tapped for 1" pipe . . to accommodate extension pipe rest arrangement.

"The Tools You Swear By ...Never At!"

NYE

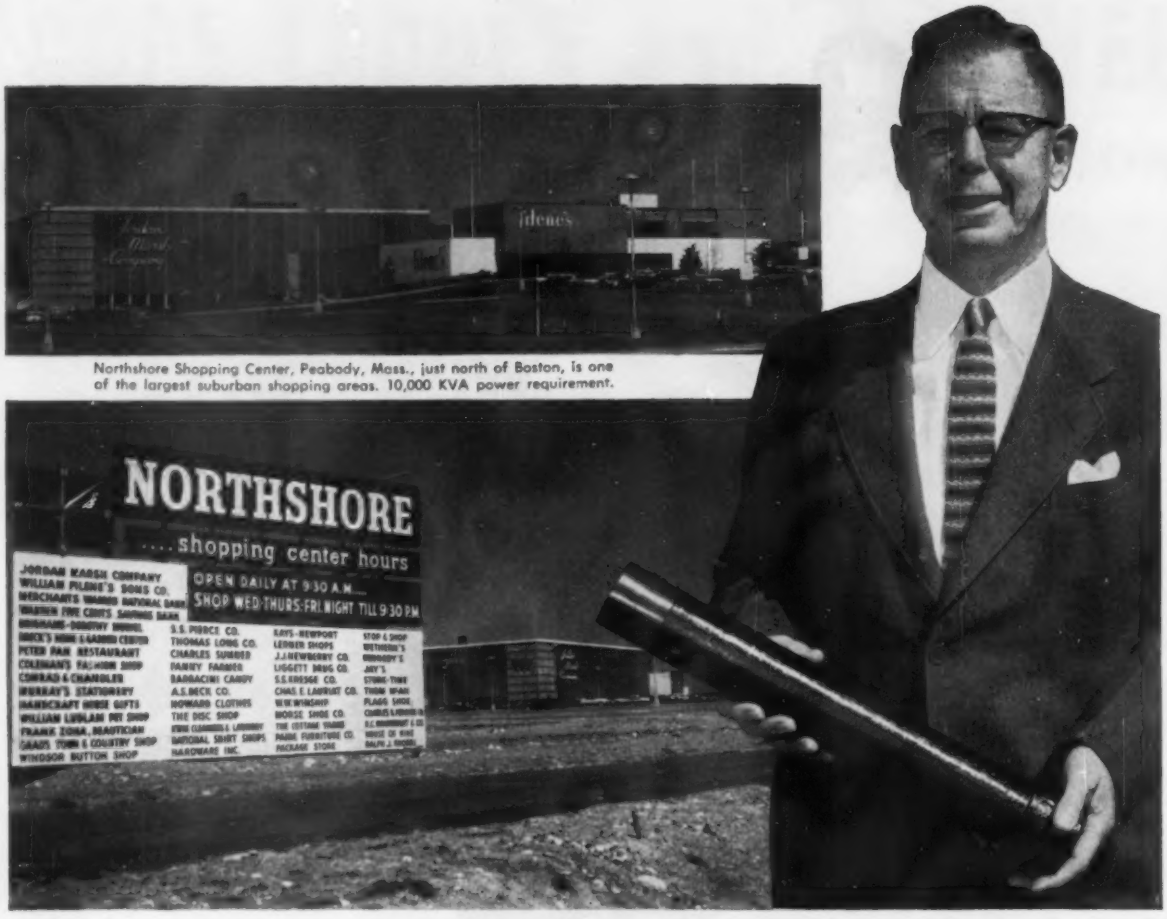


88B-T
½" to 4"

New extra strong legs. Tray folds when legs are in closed position.

NYE TOOL COMPANY

4126 FULLERTON AVENUE • CHICAGO 39, ILLINOIS



Northshore Shopping Center, Peabody, Mass., just north of Boston, is one of the largest suburban shopping areas. 10,000 KVA power requirement.

"Putting in BERMICO CONDUIT was the easiest part of the job"

AL KENWORTHY,
Electrical Contractor, Everett, Mass.

"When I saw the area to be wired, I expected the worst," reports Mr. Kenworthy, President of Kenworthy & Taylor. "It was craggy, rooted, and uneven."

"Luckily, Bermico was the specified conduit. Bermico is lightweight. It's easy to work with . . . its fittings simplify every installation problem. Putting in Bermico Conduit was the easiest part of the job."

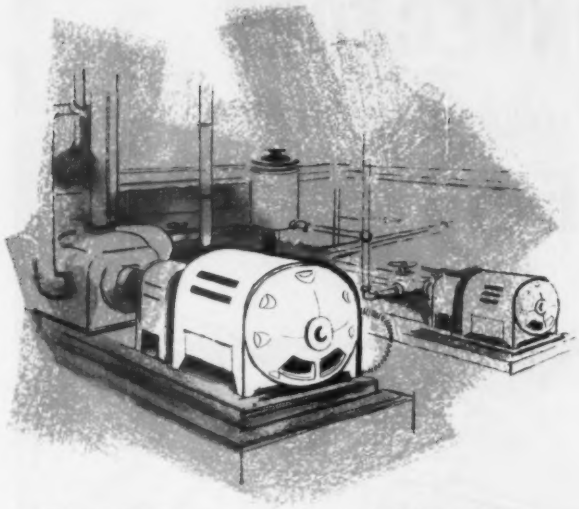
For fast, money-saving installations . . . use Bermico on all your jobs. Bermico is made from cellulose fibre, impregnated with coal tar pitch. Each 8-foot length is precision engineered, with smooth inside bore to allow easy cable pull-through without abrasion. It has high dielectric strength. Bermico is long lasting, too . . . extremely resistant to acids, alkalies, heat, water and corrosion. Try it.

Distributed by WESTINGHOUSE Electric Supply Company
Offices in Principal Cities

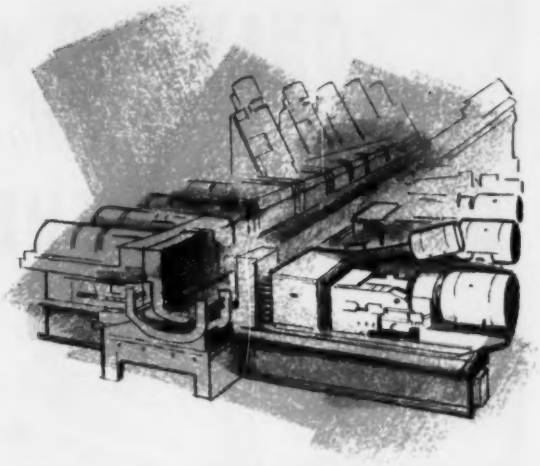
Another Quality Product of

BROWN COMPANY

General Sales Office: 150 Causeway Street, Dept. 1569, Boston 14, Mass. *Mills:* Berlin, N. H.; Corvallis, Oregon



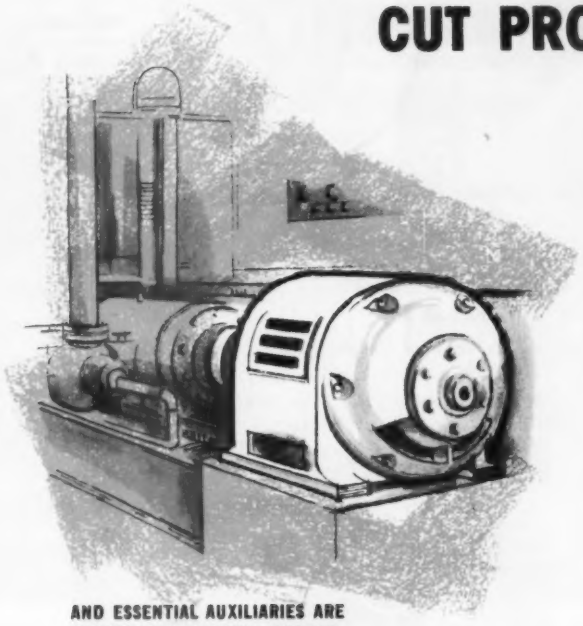
FLUID PROCESSING EQUIPMENT
STAYS "ON STREAM"



SILICONE-INSULATED MOTORS KEEP
PRODUCTION GOING DESPITE OVERLOADS

HERE'S WHY . . .

SILICONE INSULATED MOTORS CUT PRODUCTION DOWNTIME



AND ESSENTIAL AUXILIARIES ARE
UNAFFECTED BY HIGH AMBIENT
TEMPERATURES, MOISTURE, OVERLOADS

Whenever downtime is measured in lost profits, it pays to specify motors insulated with silicones. These motors . . . with extra service factor built in . . . keep production moving even when overloaded as much as 50 percent.

That's because they are designed to let the extra thermal capacity of Dow Corning Silicones carry overloads well above normal rating.

And they operate more efficiently. For example, in one case an exhaust fan requires only 40 horsepower except for the first half-hour of operation when colder, heavier air boosts the load to 60 hp. A silicone insulated 40 hp, 1.50 service factor motor was installed and operates at top efficiency on normal load, handles the half-hour overload with ease.

When you specify service factor motors, there's no need to overmotor for occasional overloads. Excessive power bills resulting from part load inefficiencies are eliminated. What's more, silicone insulated motors withstand high ambients, moisture, some corrosive atmospheres and hazards that cause other motors to fail.

Silicone insulated service factor motors are available from several leading manufacturers . . . and many of the advantages of service factor motors are available from motors that have been rewound with Dow Corning Silicones.

Send for your copy of a new booklet detailing the advantages of silicone insulated equipment.

Specify

DOW CORNING SILICONES

and *Save*

first in silicones

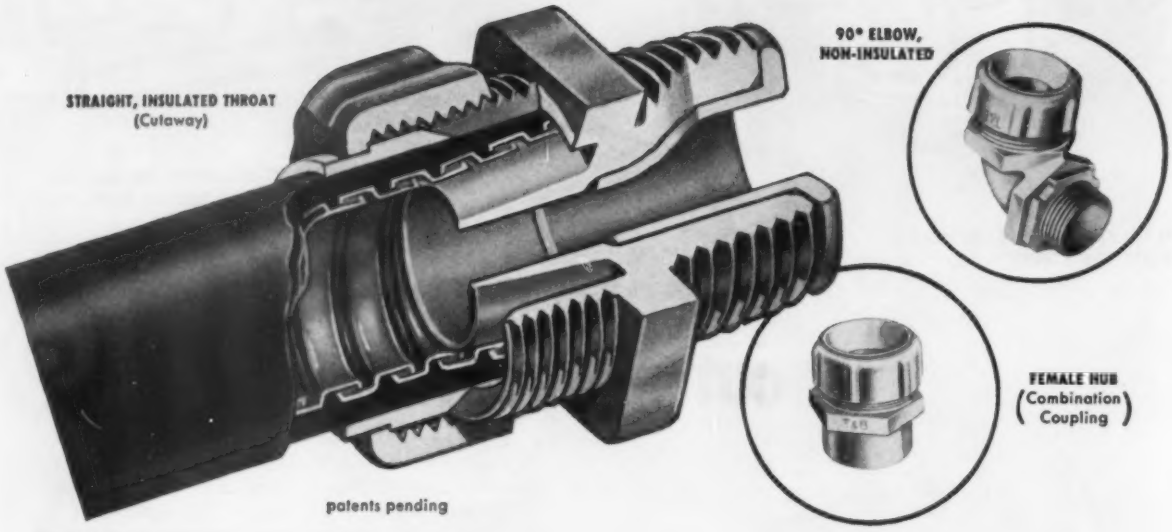
Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D. C.

ONLY T&B CONNECTORS

*for flexible liquid-tight conduit**

OFFER ALL THESE ADVANTAGES



THE T&B LINE provides a size range of ⅜" to 4" in the straight, 45° and 90° angle types . . . both insulated and non-insulated.

THE T&B LINE includes combination couplings from ⅜" to 1¼".

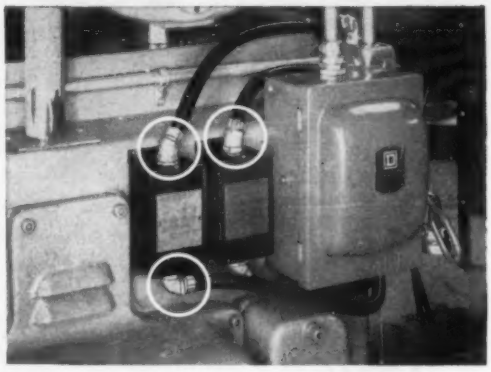
A T&B Liquid-Tight connection can't be half safe. The mechanical strength, continuity of ground, and oil seal are all interdependent. Each gives positive assurance that you have all three. And T&B's more compact design means easier installation and improved appearance.

Your T&B distributor has this complete line in stock. Be sure to ask for a demonstration . . . or write direct to T&B for detailed specifications.

* *Sealtight or equivalent*

THE T&B INSULATED LINE complies with all codes:

The National Electric Code (Paragraph 3736b)
J.I.C. Standards (Paragraphs 22.1.7 and 22.2.2)
Machine Tool Electrical Standards (Paragraph 22.1.7)



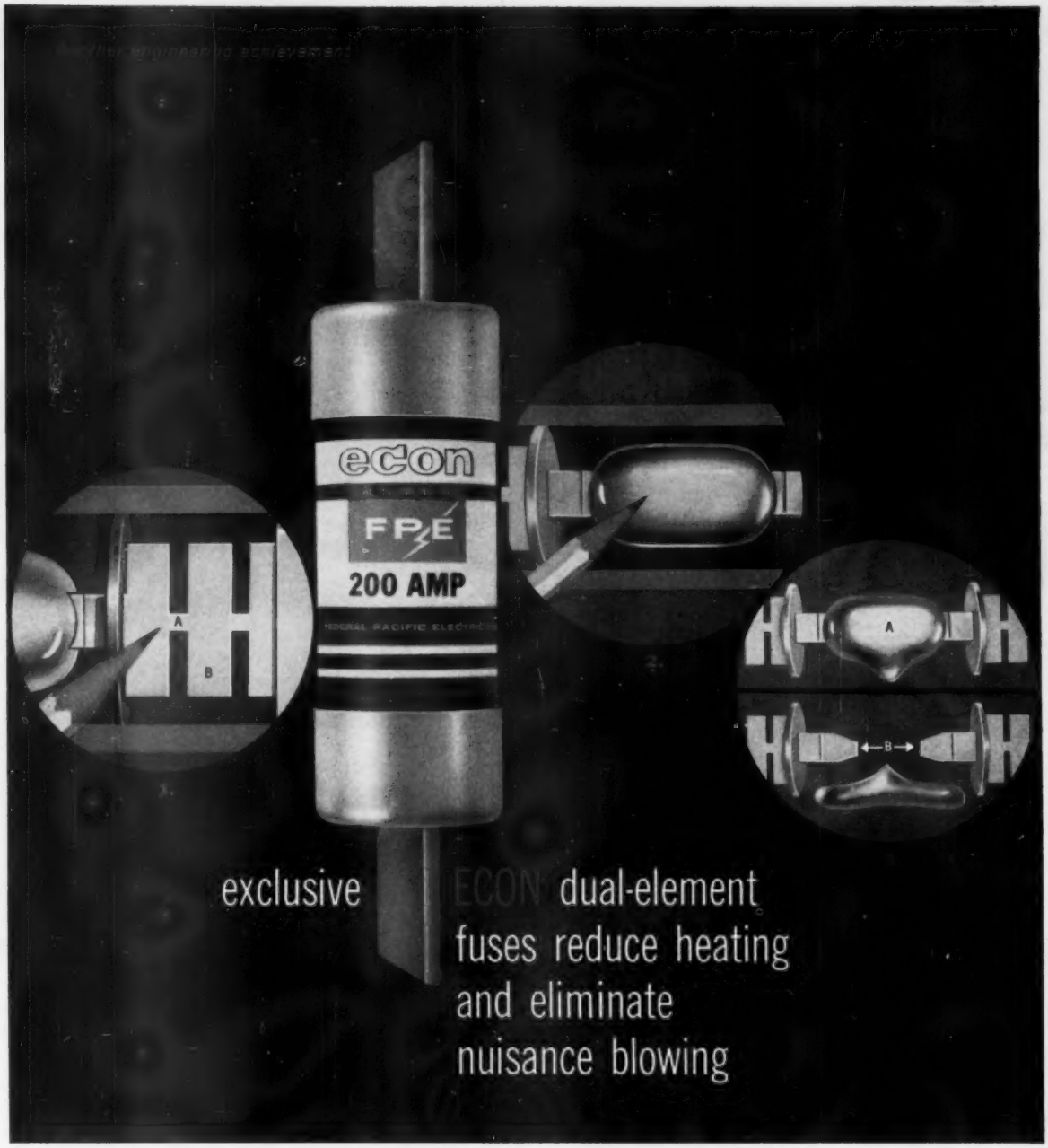
LOOK FOR THIS SIGN — AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED **T&B** DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

THE THOMAS & BETTS CO.

INCORPORATED
34 BUTLER STREET, ELIZABETH 1, NEW JERSEY
THOMAS & BETTS, LTD., MONTREAL, P. Q., CANADA
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



Using an exclusive thermal-alloy element which reduces complexity and improves reliability—ECON Dual-Element fuses blow only when they are supposed to blow. You get: Positive protection of equipment...minimum fuse replacement costs...reduced downtime. Loose or corroded connections which cause high temperatures open ECON Dual-Element fuses before the temperature can become destructive. Result—cooler operation. Available in Knife Blade or Ferrule type from 0 to 600 amps, 250 and 600 v. For complete details write: Economy Fuse Division, Federal Pacific Electric Company, Dept. 336, Chicago, Illinois.

1. INSTANTANEOUS ACTION ON SHORT CIRCUITS—Fuse links at either end open the circuit immediately when a dangerous "short" develops. Fuse links (A) melt away instantly causing heavier sections (B) to drop away, completely interrupting circuit.

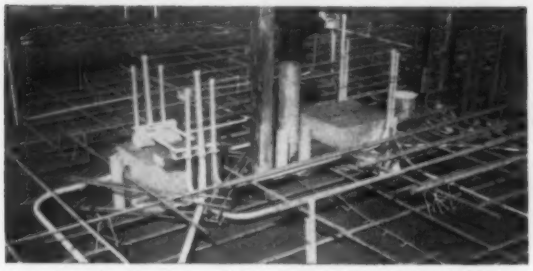
2. TIMED DELAY ON MOMENTARY OR HARMLESS OVERLOADS—Exclusive ECON-Alloy thermal element takes harmless overloads up to 500%...calibrated delay action prevents needless fuse blowing... unnecessary downtime.

3. QUICK, POSITIVE ACTION ON DANGEROUS OVERLOADS—When overload exceeds predetermined heat and time limits, ECON-Alloy (A) changes instantly from solid to liquid, positively interrupting circuit. NOTICE: EXTRA WIDE GAP (B) PROVIDES "SAFE-BREAK" DISTANCE ...PREVENTS ARCING.

FPE **ECONOMY FUSE DIVISION** CHICAGO, ILLINOIS
FEDERAL PACIFIC ELECTRIC COMPANY

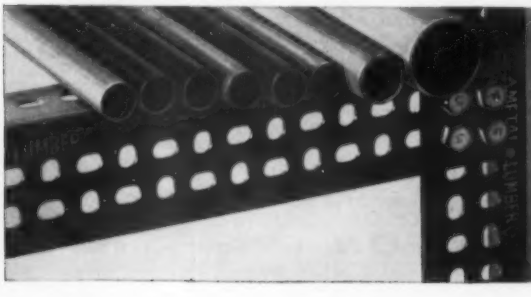
In Prairie Shores ...THE BEST COSTS

On-the-job bending is easy and accurate when you use Republic ELECTRUNITE E.M.T. and the Republic Bending Tool. Follow the full-length "GUIDE-LINE" and the markings on the Bender to avoid "wows", wasted time, materials. Keep production on schedule.



Compact stub groupings, good alignment, are marks of craftsmanship. Perfectly round ELECTRUNITE E.M.T. stays round, even when knocked over and carefully straightened, is the report on the job. Another reason why . . . *the best costs less installed.*

Uniform concentricity of Republic ELECTRUNITE E.M.T. assures snug fit of couplings and connectors—shutting out moisture and concrete. Proof can be found in the millions of feet of ELECTRUNITE that has been installed in concrete. Installations made more than 25 years ago are still in service, ready for more service tomorrow.



REPUBLIC METAL LUMBER

Easy to use Republic METAL LUMBER® is the ideal material for building conduit and cable supports, frames for mountings, and other applications. Saves installation time. Use it like common lumber. Simply measure, cut, and assemble with ordinary bolts and nuts. Available in packages of 10-foot lengths.

Apartments, Chicago
LESS INSTALLED

80,000 feet of Republic ELECTRUNITE® E.M.T. was used in the construction of Prairie Shores Apartments, Building #2, Chicago, Illinois. And more has been ordered for the third building of this group. Because . . . *The Best Costs Less Installed!*

ELECTRUNITE E.M.T. is "INCH-MARKED"® in feet and inches for easy, accurate measuring. Full length "GUIDE-LINE"® keeps bends in the correct plane, avoids costly "wows". Exclusive "INSIDE-KNURLING" with new SILVER-SLICK Finish makes wire pulling up to 37% easier, wire pushing easier, too.

In bending, pouring, wire pulling, pushing, ELECTRUNITE E.M.T. meets every on-the-job installation test. ELECTRUNITE is lightweight, easy to handle. Yet, provides all the corrosion-resistance protection, strength, and advantages of steel.

ELECTRUNITE E.M.T. is produced to meet all electrical codes, specifications, and carries the UL Seal of Inspection. To learn more about Republic ELECTRUNITE E.M.T., call your local ELECTRUNITE distributor, or, write direct. Send coupon.

Long runs are easy with Republic ELECTRUNITE E.M.T. With "INCH-MARKS", measuring is easy. No threads to cut, no runs to turn. Joining is simple with fit-tight couplings and connectors. Republic's ELECTRUNITE tightly adhering galvanized coating protects against corrosion. Won't flake off, won't chip off.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. EC-7673
1441 REPUBLIC BUILDING · CLEVELAND 1, OHIO

Please send more information on the following Republic products:

☐ Republic ELECTRUNITE E.M.T.
☐ Republic Bending Tool ☐ Republic METAL LUMBER

Name_____ Title_____
Firm_____
Address_____
City_____ Zone____ State_____

THE "CLASSIC" WITH METAL LOUVERS

Go modern with

Sylvania's New CLASSIC *Series*

. . . a Triumph of Fixture Design!

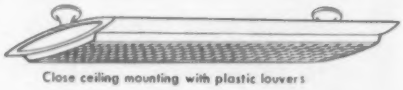
"The finest suspension mounted fixture in years"—this will be your reaction when you've seen Sylvania's exciting new fixture series, the CLASSIC. Here is a fixture in a class all its own . . . one that will take a prominent place in your lighting plans.

To develop a completely fresh and different approach to lighting fixture design, Sylvania retained the services of the renowned industrial designing firm, Peter Muller-Munk Associates.

The result of months of concentrated effort by this firm and Sylvania's own design engineers is presented here for the first time—the CLASSIC Series.

We sincerely believe that the CLASSIC is the very finest fluorescent fixture produced in a long number of years.

Pendant mounting with diffused plastic panel



Close ceiling mounting with plastic louvers

The CLASSIC is *really* new . . . designed by experts to give commercial interiors a fresh, distinctive appearance together with outstanding illumination.

You'll like the sleek, trim lines and slim shallowness of this fixture . . . the flared, softly-diffusing side panels . . . the harmonious matching of plastic and metal . . . and the choice of three excellent shieldings.

You'll like its lighting characteristics, too. The extremely high efficiency, balanced distribution, low brightness contrasts and excellent diffusion of the CLASSIC makes it ideal for every commercial application.

To fully appreciate the CLASSIC, you must see it for yourself. Photographs and sketches cannot show the true beauty of this new series. Send today for full information. At the same time ask to have the CLASSIC demonstrated in your own office. Once you've seen it, you'll agree that this Sylvania fixture is truly a triumph of fixture design.

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
Department 59-4
One 48th Street, Wheeling, West Virginia

GO MODERN WITH LIGHTING BY

SYLVANIA

Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

FLUORESCENT LIGHTING FIXTURES AND SYSTEMS • BEST FIXTURE VALUE IN EVERY PRICE RANGE

QUALITY

CADWELD ground rod and cable to steel electrical connections are superior to all mechanical or soldered types.

Competitively priced, these quality connections are permanent and cannot loosen or corrode.

Simplified ordering—specify type connection and quantity only—equipment furnished automatically.

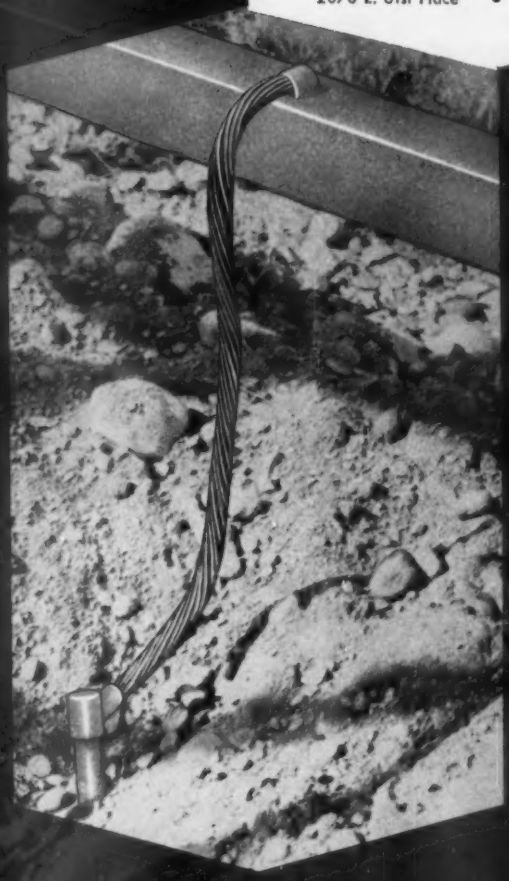
originators and developers of the copper thermit principle

CADWELD®

electrical connections

ERICO PRODUCTS, INC.

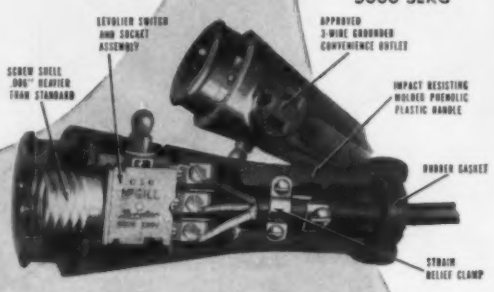
2070 E. 61st Place • Cleveland 3, Ohio



McGILL® PORTABLE LAMP GUARDS are always a little better ...and all are UL inspected

- Rugged, steel wire cage. Spot-welded with extra heavy zinc plated, chromate finish.
- Tough, gray molded phenolic handle resists impact, heat oils, greases, some acids, moisture and abrasion.
- Concentrating end lens. • Convenience hook.
- Approved 3-wire grounded convenience outlet.
- Exclusive McGill LEVOLIER Switch. • Rotary reflector.

No. 5000 SLRG


LEVOLIER SWITCH AND SOCKET ASSEMBLY
APPROVED 3-WIRE GROUNDED CONVENIENCE OUTLET
IMPACT RESISTING MOLDED PHENOLIC PLASTIC HANDLE
RUBBER GASKET
STRAIN RELIEF CLAMP

An extra margin of quality is designed and built into the complete line of McGILL industrial portable lamp guards for safe, dependable utility. Rugged, heavy duty construction and selected materials withstand the punishment of rough use. The famous McGILL LEVOLIER switch mechanism provides a degree of dependability not found in ordinary portables. It's economical to specify the best.

More than 100 different types of McGILL portable lamp guards have been developed to meet the particular requirements of a wide range of service conditions. Cages 50 to 200 watt. 660 watt, 250 volt sockets.

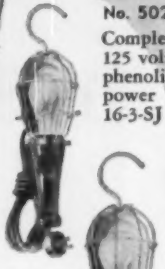
For detailed descriptions of the McGILL line of top quality electrial specialties, including portable lamp guards, and Levolier switches write for McGILL ELECTRICAL SPECIALTIES CATALOG No. 84.

No. 7100 SR Lamp Guard

Thumb clamp arrangement for cage to change lamps quickly without tools. Gray Neoprene-butyl handle; reflector; LEVOLIER switch.

No. 5025 SRG Service Light

Completely grounded service light. 15 amp., 125 volt convenience outlet built into molded phenolic handle. Safe on-the job source for power tools. Levolier switch and 25 ft. 16-3-SJ gray rubber cord.



No. 5000 SR Lamp Guard

With 15 amp., 125 volt convenience outlet in impact and heat and grease-resisting positively insulating molded phenolic handle. No-Rol cage, Levolier switch and reflector.

No. 3006 Vaporproof Lamp Guard

Watertight, vaporproof and moistureproof for complete safety. Heat and impact resisting glass globe screws into a silicone rubber gasket. Handle molded of macerated phenolic.

No. 652 Lamp Guard

Rubber hook handle, thumb release clamp for easy bulb replacement. Can be hung, for maximum light, from hook or handle.

Write for Free McGill Catalog No. 84

engineered electrical products

McGILL®

precision needle roller bearings

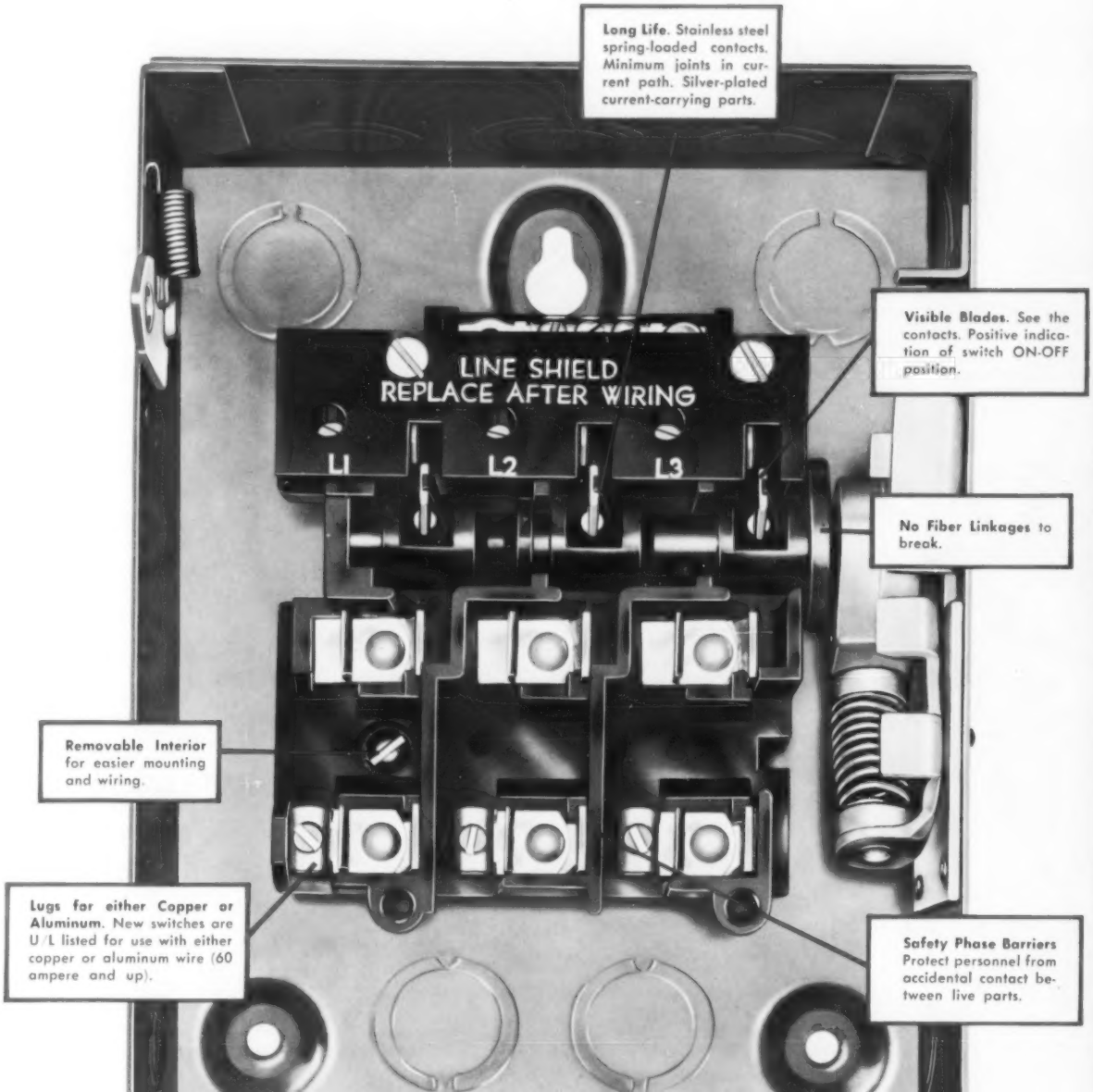
McGILL MANUFACTURING COMPANY, INC., ELECTRICAL DIV., 450 N. CAMPBELL ST., VALPARAISO, INDIANA

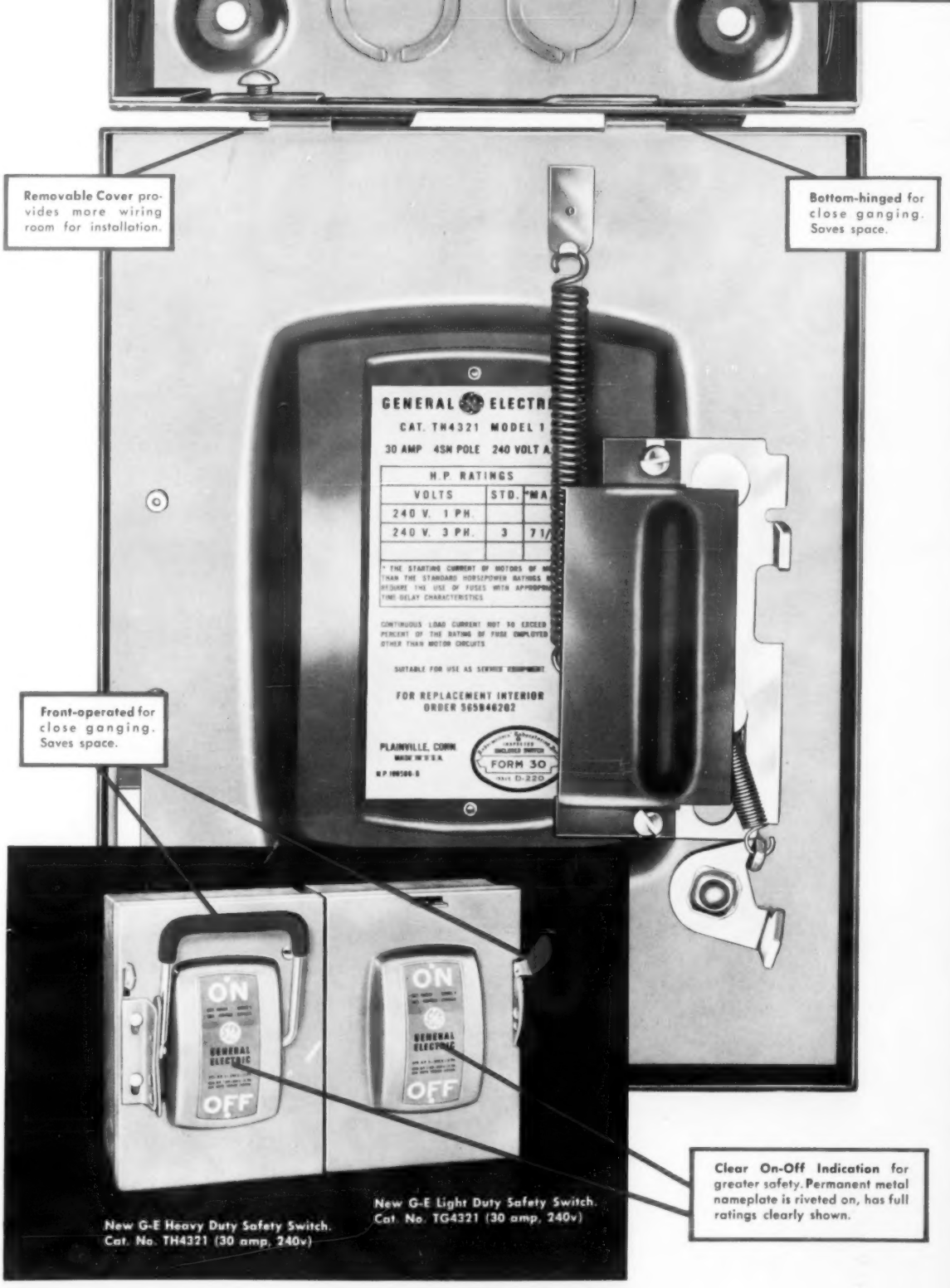
Behind this cover are bold new advances in safety switch design...

Behind this cover are bold new advances in safety switch design...

General Electric announces completely new lines of safety switches... with savings in space, easier installation, long life and maximum safety.

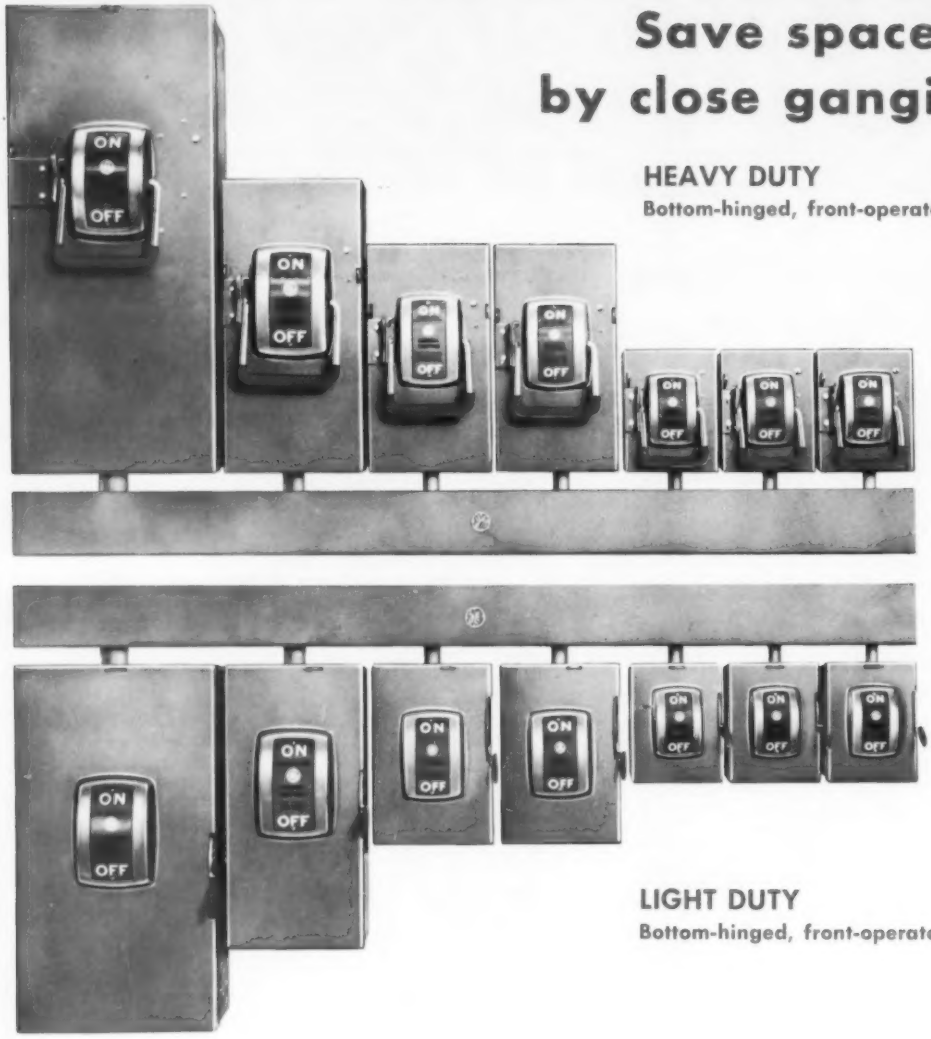
General Electric's new light and heavy duty safety switches are completely different in concept and design. And the Heavy Duty (Type A) sells at Normal Duty (Type C) price levels.


Long Life. Stainless steel spring-loaded contacts. Minimum joints in current path. Silver-plated current-carrying parts.
Visible Blades. See the contacts. Positive indication of switch ON-OFF position.
LINE SHIELD
REPLACE AFTER WIRING
L1
L2
L3
No Fiber Linkages to break.
Removable Interior for easier mounting and wiring.
Lugs for either Copper or Aluminum. New switches are U/L listed for use with either copper or aluminum wire (60 ampere and up).
Safety Phase Barriers Protect personnel from accidental contact between live parts.


Removable Cover provides more wiring room for installation.
Bottom-hinged for close ganging. Saves space.
GENERAL ELECTRIC
CAT. TH4321 MODEL 1
30 AMP 4SN POLE 240 VOLT A
H.P. RATINGS
VOLTS
STD.
240 V. 1 PH.
240 V. 3 PH. 3
FOR REPLACEMENT INTERIOR ORDER 565846202
PLAINVILLE, CONN.
FORM 30
Front-operated for close ganging. Saves space.
ON
OFF
GENERAL ELECTRIC
New G-E Heavy Duty Safety Switch. Cat. No. TH4321 (30 amp, 240v)
New G-E Light Duty Safety Switch. Cat. No. TG4321 (30 amp, 240v)
Clear On-Off Indication for greater safety. Permanent metal nameplate is riveted on, has full ratings clearly shown.

GENERAL ELECTRIC

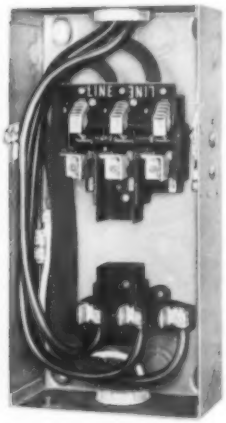
Save space by close ganging



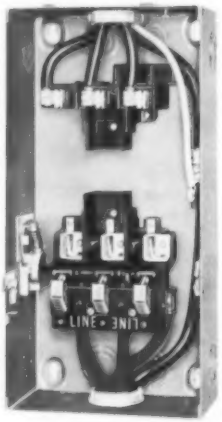
HEAVY DUTY
Bottom-hinged, front-operated

LIGHT DUTY
Bottom-hinged, front-operated

Now you can wire incoming lines at top or bottom



Old Way wastes time, work and wire. Heavy cable is hard to bend and expensive. Not necessary with new G-E safety switches.



New Way: Line lugs can be at bottom, make it easy to do a neater job in less time. ON-OFF indication is unchanged.

Both G.E.'s new heavy and light duty lines (100 ampere and up) can be wired with the line wire at the *bottom*. This saves expensive cable previously wasted, plus the time and trouble it takes to bend cable around inside of box. *And the ON-OFF indication remains the same regardless of line location.* The result is a neater, more economical installation in less time.

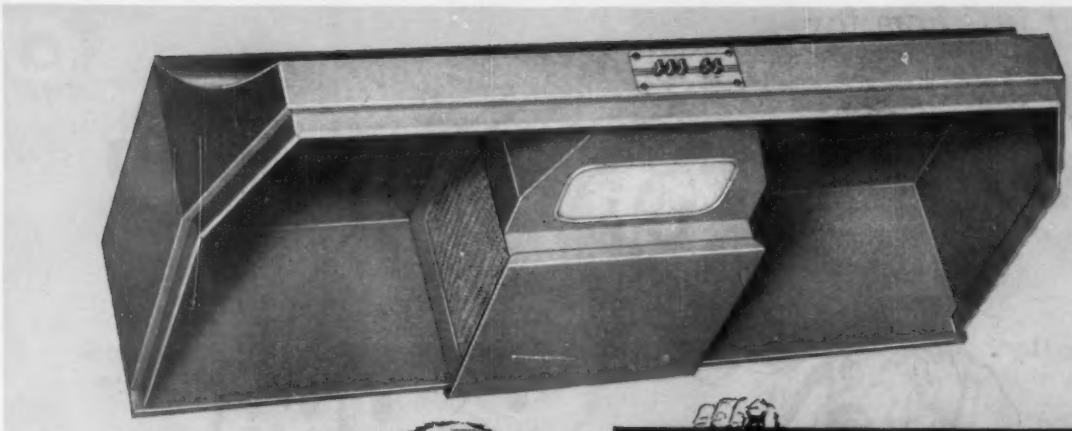
●

General Electric's new safety switches are fully described in Bulletin GEA6756. For your free copy, write General Electric Company, Circuit Protective Devices Department, Plainville, Connecticut.

GENERAL ELECTRIC

CPD67

Printed in U.S.A.



Installs in half the time of ordinary range hoods

NEW Broan Dual Blower Hood

a fully integrated package

There is more of everything for everybody in this NEW Broan Hood. The housewife gets a better performing installation — the extra power of a dual blower. The contractor gets more to "sell" — at a better price. For example, the hood and blower are factory prewired and are put in place as a single unit. Many contractors report their installation time is only half of their former experience. That difference can mean many more successful jobs for you.

Get the full facts on this BEST ENGINEERED hood today. See your distributor, or write for full information.

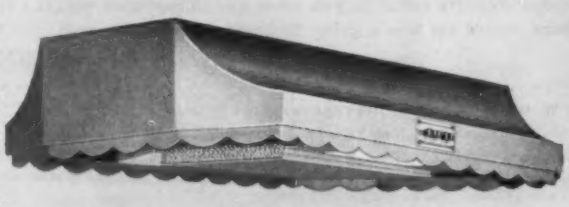
Broan MANUFACTURING COMPANY, INC.

948 West State St., Hartford, Wisconsin | Near Milwaukee

Specialists in Quality Ventilating Equipment for More than 25 Years.

Additional Features—

- Vertical or horizontal discharge directly into 3¼" x 10" standard duct.
- Built-in spring-loaded backdraft damper.
- Blower removable without tools. Two lifetime aluminum filters.
- Brilliant illumination — ribbed crystal lens.
- Seamless welded construction — no grease-catching trim strips or rivets.
- Saves cabinet space — self contained.
- "Contour-corner" design — out of the way of cabinet doors.
- Modern or colonial styling, five widths, stainless steel or colors.



Dual-Blower Island Hood

The Broan Island Hood is completely self contained, offers fast, economical installation plus dual-blower power. Combines all the engineering advances and features of the regular Dual-Blower Hood. Choice of styles, widths, finishes.

"But just how far can I trust these rumors?"

Smart contractors depend on DODGE REPORTS instead of gossip

In today's fast-moving new construction market, rumor chasing can cost far more than *Dodge Reports*. Successful contractors are relying on *Dodge Reports* more than ever for information that enables them to select the kind of jobs they want to go after... the jobs that can do them the most good. They get more good opportunities through access to more timely *facts*.

Dodge Reports come to you each day. They give you advance notice on who's going to build what and where ...in your area, in the types of construction you're interested in. You select the jobs that look right for you. *Dodge Reports keep* you informed, too. Follow-up reports tell you when bids (or re-bids) are wanted, when plans and specs are ready – even who you're competing with. It's the kind of help you need to follow up a job.

If you do business anywhere within the 37 eastern states, you should learn how *Dodge Reports* can improve your operation and your profit picture.

WRITE FOR FREE BOOK

F. W. Dodge Corporation, Construction News Division,
119 West 40th Street, New York 18, N. Y., Dept. ECM69

Send me the book "Dodge Reports – How to Use Them Effectively" and let me see some typical Dodge Reports for my area. I am interested in the general markets checked below.

☐ House Construction ☐ General Building
☐ Engineering Projects (Heavy Construction)

Area_____

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

Diamond has all 3 portable cords

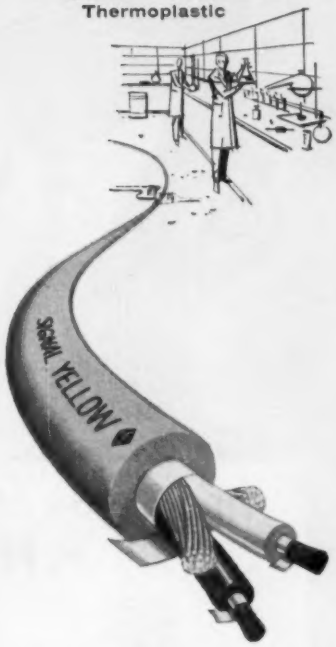
Red-D-Prene®
Neoprene Sheathed

for hot, oily locations

Black Diamond
Rubber Sheathed

for general purpose use

Signal Yellow
Thermoplastic



for all locations where heat is no problem

Red-D-Prene for mill and plant use is designed with tough, oil, heat and flame resistant Type MD (Mill Duty) neoprene jacket in industrial red for ready identification.

Black Diamond has durable rubber jacket protecting against alkalies, acids and moisture. Very flexible construction prevents kinking in service.

Signal Yellow has a jacket of yellow thermoplastic that is quickly seen . . . clean to handle . . . smooth sheath will not readily collect dirt. Easy to pull.

DIAMOND IS ALSO A PRIME SUPPLIER OF

DTW Small Diameter Building Wire

DTX® Non-Metallic White Sheathed Cable

Type SE Service Entrance Cable (Armored & unarmored)

DUF® Type UF

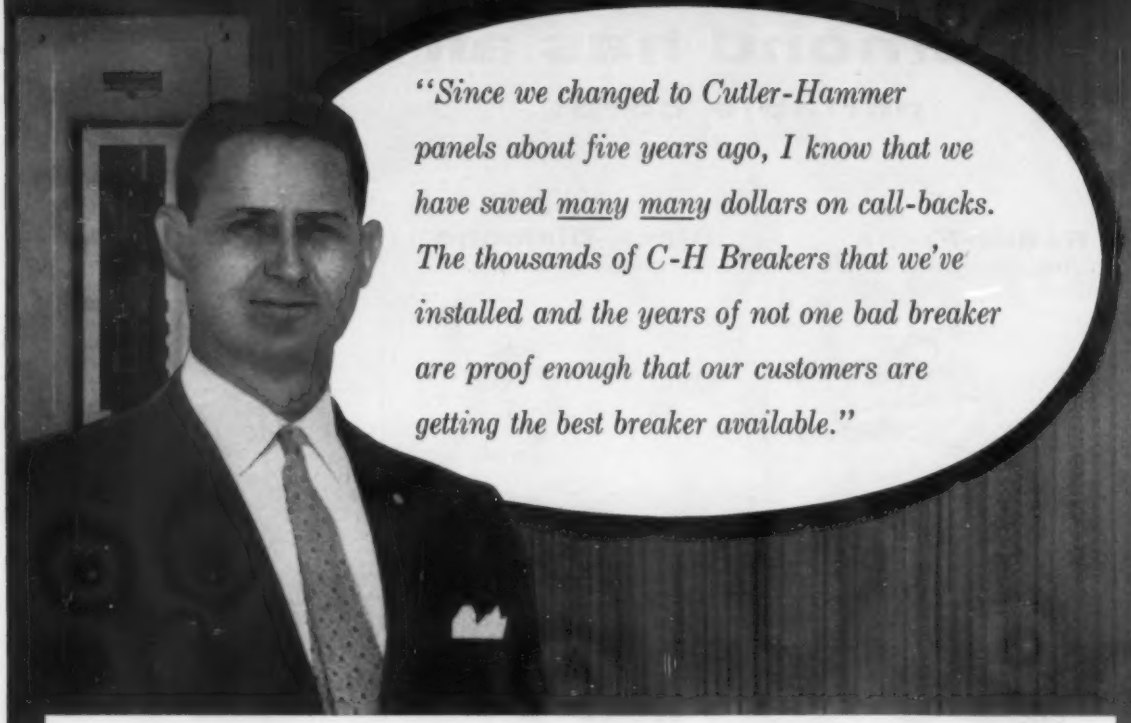
ABC Armored Bushed Cable

Range Cord Sets

Trade Mark ®

DIAMOND
WIRE and **CABLE** Company
Sycamore, Illinois
WAREHOUSE: BIRMINGHAM, ALABAMA

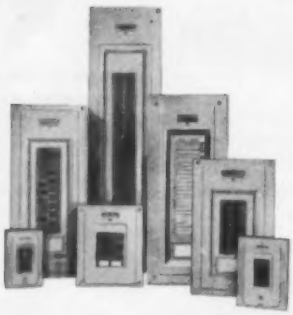
Says: Mr. T. C. Williams, Williams Electric, Grand Prairie, Texas



"Since we changed to Cutler-Hammer panels about five years ago, I know that we have saved many many dollars on call-backs. The thousands of C-H Breakers that we've installed and the years of not one bad breaker are proof enough that our customers are getting the best breaker available."

Thousands of Contractors use C-H Unit Breakers

KNOW THE FACTS!



You won't lose profits on service complaints, you won't have unhappy customers, if you buy circuit breakers on performance, *not* on claims. That's what thousands of profit-minded contractors will tell you about C-H Unit Breakers.

C-H breaker performance pays off the same way on large as well as small jobs. Prominent housing projects across America are C-H Unit Breaker equipped, to the satisfaction of builders, contractors and home owners.

For customer satisfaction and full, steady profit, performance points to Cutler-Hammer as your choice in breakers, and 568 Authorized Cutler-Hammer Distributors will agree with you on that choice!

There's a difference . . . Are you missing it?

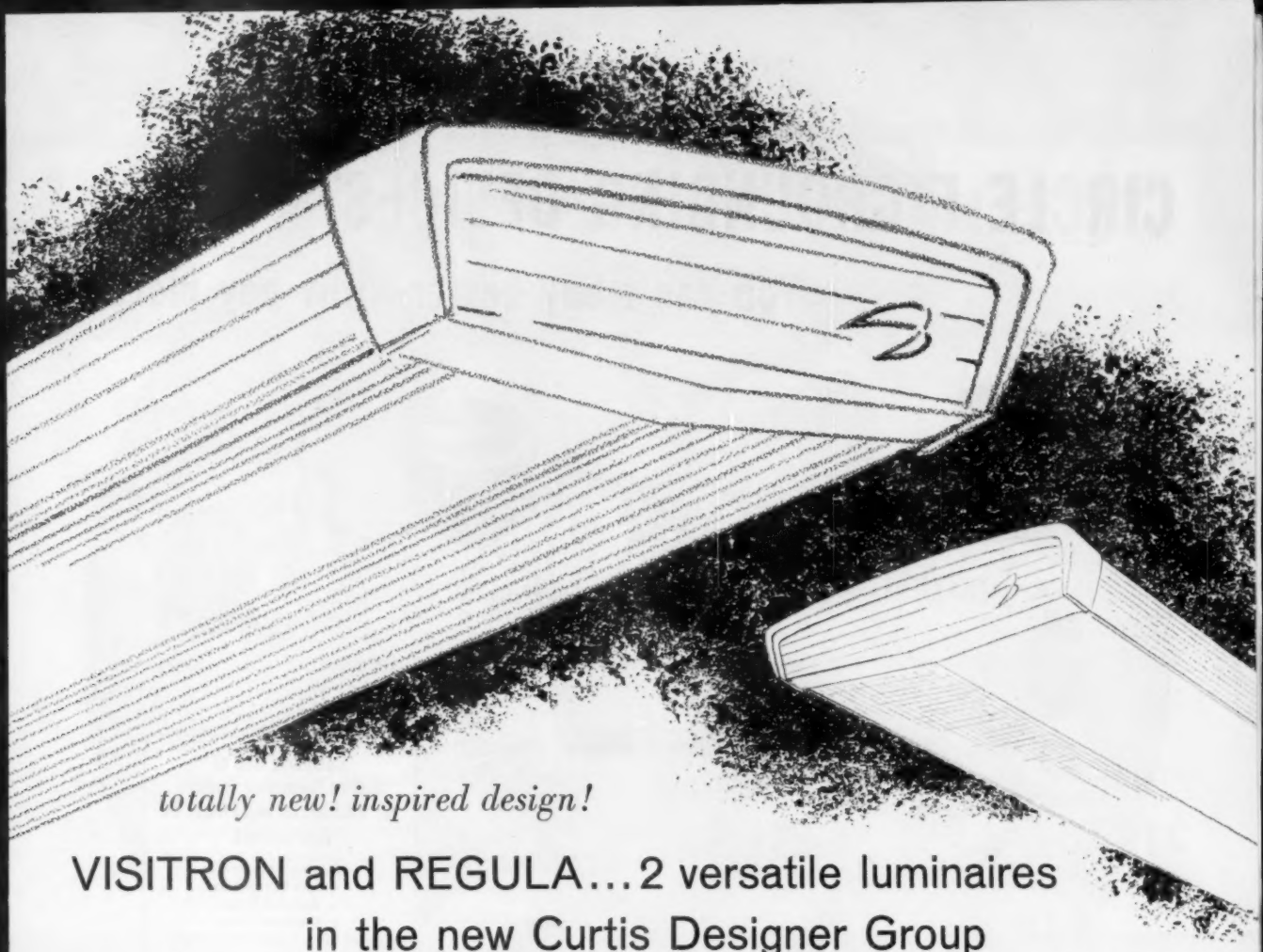
You can't look at two violins and determine which is best. The same goes for circuit breakers. But the difference shouts at you when you judge them on their performance. Thousands of successful contractors buy their circuit breakers on performance . . . *not* on looks and claims, and find the performance of C-H Breakers amounts to an extra "edge" that insures customer satisfaction and betters their business. Get this extra edge for yourself . . . standardize on Cutler-Hammer. See your nearby Authorized Cutler-Hammer Distributor. or write for the new selection guide, *Handi-Log*, Pub. EN100-M241, Cutler-Hammer Inc., Milwaukee 1, Wisconsin.

CUTLER-HAMMER CONTROL C-H

CUTLER-HAMMER

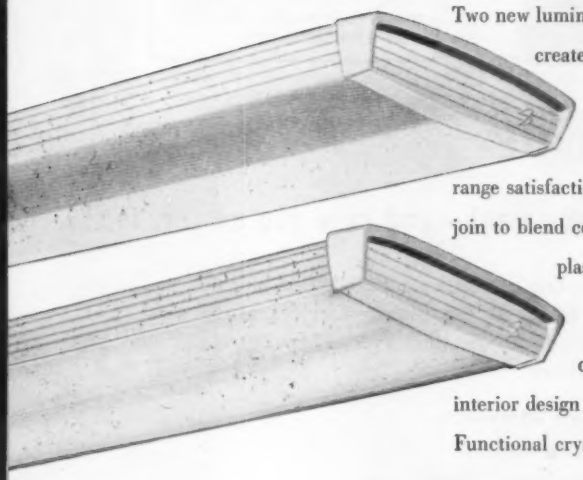
Cutler-Hammer Inc., Milwaukee, Wis. • *Division:* **Airborne Instruments Laboratory.** • *Subsidiary:* **Cutler-Hammer International, C. A.**

Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.



totally new! inspired design!

VISITRON and REGULA... 2 versatile luminaires in the new Curtis Designer Group



Comes now a truly forward concept in lighting fixture styling. Two new luminaires by Curtis, first in a *Designer Group*, created in the contemporary mood.

THE VISITRON . . . brimming in trim, slim-line beauty with the future "designed in" to offer long range satisfaction. Here imagination and entrancing realism join to blend contemporary design with the traditional in illumination. White plastic diffusers provide a luminescence extremely pleasing to the eye.

THE REGULA . . . ushering in an advanced trend that will be here for years to come. Smooth flowing contours dwell in harmony with today's contemporary interior design . . . blend with the specially chosen furnishings of any decor. Functional crystal plastic prismatic refractors create a sparkling lighting effect.

Curtis-AllBrite Lighting, Inc.,
Curtis Lighting Division, 6135 W. 65th St., Chicago 38, Ill.
AllBrite Lighting Division, 352 Shaw Rd., So. San Francisco, Cal.
Visioneers in Planned Lighting.

CURTIS

DESIGNER GROUP

CIRCLE F GROUNDING DEVICES

You can't buy better--why pay more?

SPECIFICATION GRADE

Complete line of 3-Wire Grounding Devices for Residential and Industrial Applications.

- Duplex Receptacles
- Single Receptacles
- Bakelite Caps
- Armored Caps
- Dryer and Power Receptacles
- Dryer and Power Cord Sets
- Range and Power Receptacles
- Range and Power Cord Sets

Your wholesaler has a complete range of sizes, types and capacities to meet your needs.

Circle F Grounding Devices give you everything you want—and save you money, too!

Figure it yourself! Circle F's complete line of grounding devices give you fast, easy installation, trouble-free service, rugged construction at low cost. Precision engineering and quality-controlled production are your guarantees of customer satisfaction and no call-backs. And Circle F Grounding Devices are available at Electrical Wholesalers everywhere for quick pick-up or delivery.

Any way you figure it... it pays to use high quality, low cost Circle F guaranteed wiring devices.

Next time you order grounding devices... say CIRCLE F and profit.

Circle F Mfg. Co.

TRENTON 4, NEW JERSEY

In Canada: Verd-A-Ray Electric Products Ltd., Montreal 9

For your wire requirements: Eastern Insulated Wire Corp. A Subsidiary
Box 591, Trenton, N. J.

FOUR FEATURES FOR OPERATOR SAFETY

1	2	3	4
STORED-ENERGY CLOSING	SPRING-OPERATED OPENING	TIME-DELAY INTERLOCK	DEAD-FRONT CONSTRUCTION

Greater safety with

General Electric ROLLOUT

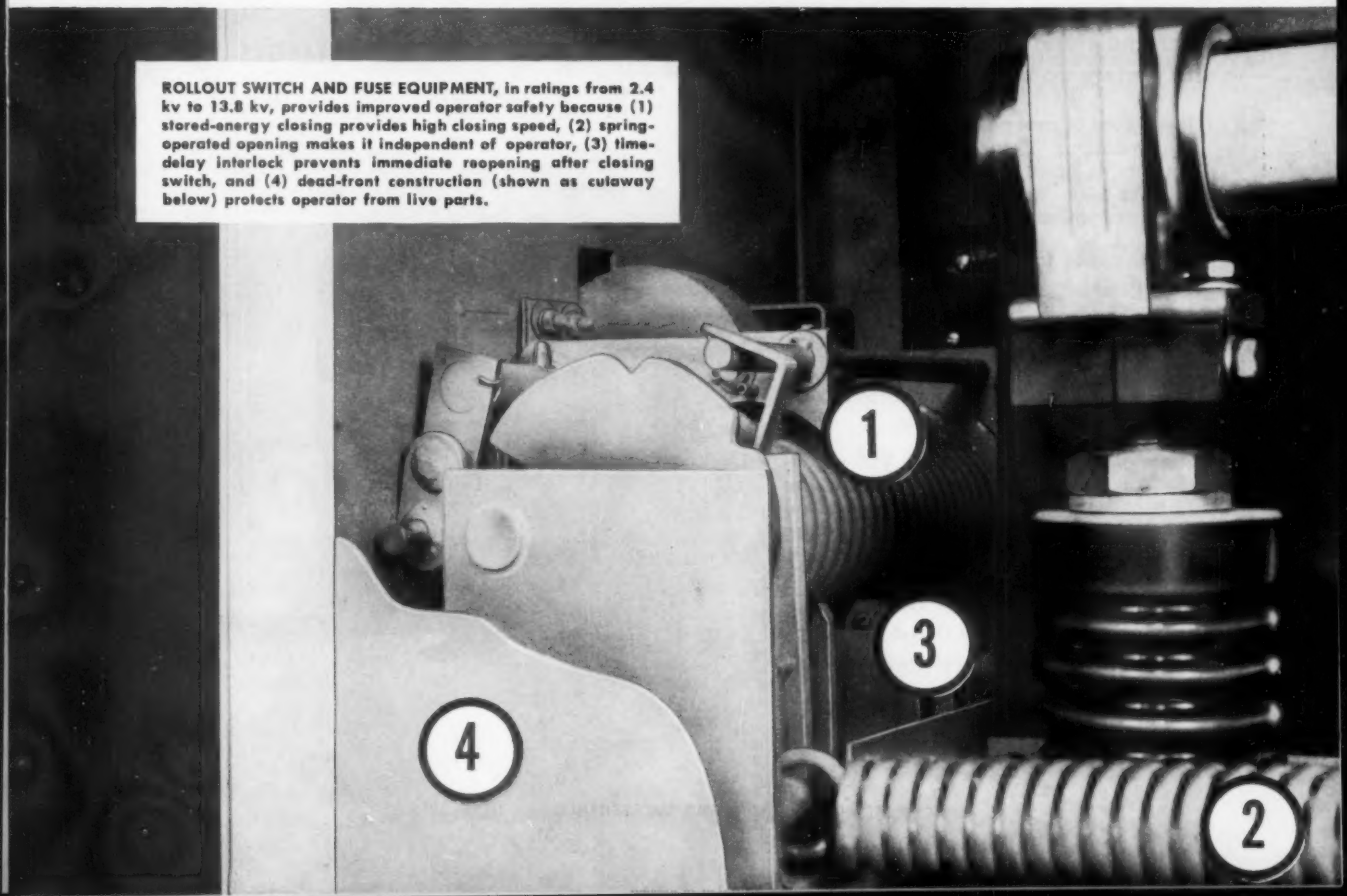
Switch and Fuse Equipment

Optimum safety is built into General Electric Switch and Fuse Equipment with stored-energy closing, spring-operated opening, time-delay interlock, and dead-front construction.

Improved protection, ease of maintenance and inspection, and installation versatility are other benefits you get with this switching and protection equipment. For more information call your nearest General Electric Apparatus Sales Office or write for Bulletin GEA-6623, General Electric Company, Section H514-4, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

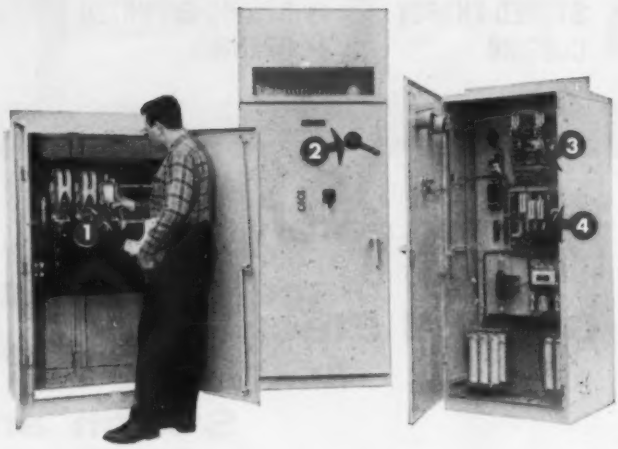


ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, provides improved operator safety because (1) stored-energy closing provides high closing speed, (2) spring-operated opening makes it independent of operator, (3) time-delay interlock prevents immediate reopening after closing switch, and (4) dead-front construction (shown as cutaway below) protects operator from live parts.

For squirrel-cage, wound-rotor, and synchronous motors to 1500 hp

LOW-VOLTAGE INDIVIDUAL STARTERS

1. **Arc chutes** are easily removed for tip inspection, and all components can be quickly replaced if necessary.
2. **Pre-installed protective devices** save valuable installation time. General Electric circuit breakers are simple to reset, and CLF fuses can be quickly replaced.
3. **Completely wired and assembled** starter can be quickly installed. Simply connect incoming power leads and motor-control leads and motor can be put on line.
4. **Air-break contactors** have silver contact tips to give long operating life with a minimum of maintenance.



Write for bulletin GEA-6584 to Section 783-102, General Electric Company, Schenectady, New York.

General Electric's complete line of starters is . . .

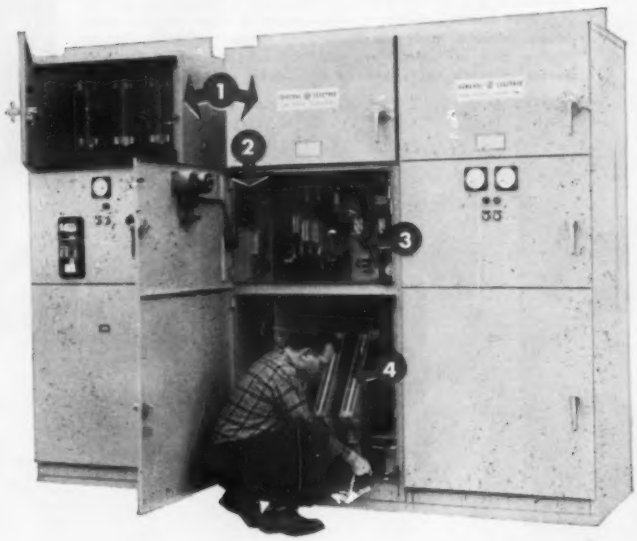
Faster, less costly to

For individual or grouped control of motors up to 3000 hp

HIGH-VOLTAGE LIMITAMP* STARTERS

** Registered Trade-mark of General Electric Co.*

1. **Individual or grouped control** is obtained by installing 30-inch deep Limitamp starters as units or in lineups, mounted back-to-back or back-to-wall with a common power bus.
2. **Ample space for cable entry** is provided at top and bottom of unit. All installation wiring is made to conveniently located terminal boards.
3. **Hinged low-voltage panel** swings out for accessibility. Front-connected components are easy to maintain.
4. **High-voltage contactor** rolls out of enclosure. Low-voltage connections are plug-in type. Tip changing and a-c coil removal are fast and require a minimum of effort and tools.



For more information contact your G-E Apparatus Sales Office, or write for bulletin GEA-6331 to Sect. 783-102, General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

LOW-VOLTAGE MOTOR CONTROL CENTERS

For flexible, grouped control of motors up to 400 hp

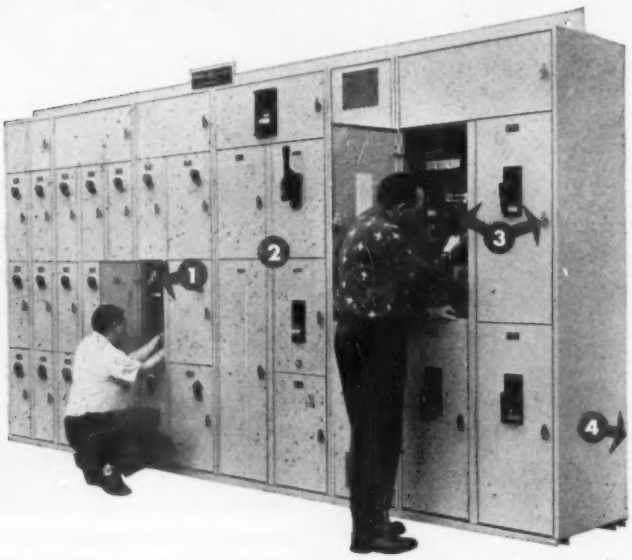
1. **All starter units in one structure** eliminates grouping of individual starter enclosures and associated installation expense.
2. **NEMA Class II construction** has factory-wired and tested interconnections. To install, simply connect power and outgoing motor-control leads.
3. **Front connected units** are accessible for speedy inspection and maintenance of wiring and components.
4. **Easily removable starter units** reduce bench maintenance time. Speed latches expedite unit removal; hold units in place when engaged. Components are readily accessible from top, front, and sides when starter unit is removed.

Write for bulletin GEA-4979 to Section 783-102, General Electric Company, Schenectady, New York.

install and maintain

LOW-VOLTAGE CABINETROL* POWER CENTERS

** Registered Trade-mark of General Electric Co.*



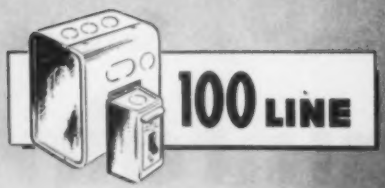
For custom-engineered grouped control of motors up to 900 hp

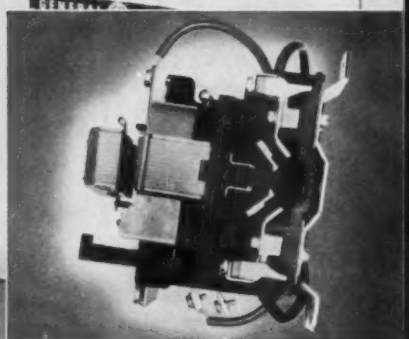
1. **Roomy starter compartments** facilitate routine inspection and maintenance without removal of starter unit from compartment.
2. **Custom engineered controls** are supplied to specific application needs. Complete system is factory-wired and tested. Installation requires only connecting incoming power and motor-control leads.
3. **Easily accessible components** are mounted with ample room for adjustment and maintenance. Spring-latch door provides easy access.
4. **Hinged, full-height rear doors** allow inspection and testing of continuous process equipment without stopping the process.

For more information contact your G-E Apparatus Sales Office or write for bulletin GEA-3856 to Sect. 783-102, General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

NOW AVAILABLE IN GENERAL ELECTRIC'S





WEDGE-ACTION DESIGN (see cross-section cutaway) gives positive "make." A quick, clean "break" is assured by spring-loaded contacts and a low-stress "kick-off" spring.

FIELD-PROVED 100-LINE DESIGN . . .

NEW SIZE 2 MAGNETIC STARTER

General Electric now offers a Size 2 magnetic starter that is 34% smaller than previous open forms, and includes all the field-proved features of General Electric's 100-Line. You get better performance, less maintenance and greater dependability because:

WEDGE-ACTION CONTACTS provide more positive "make". Reduced armature mass and spring-loaded contacts practically eliminate bounce. Contact springs and a special "kick-off" spring provide positive "break". Vertical contacts shrug off dirt and dust.

NEW ARC TRAP DESIGN actually attracts arcs away from contacts and dissipates them harmlessly to prolong contact life.

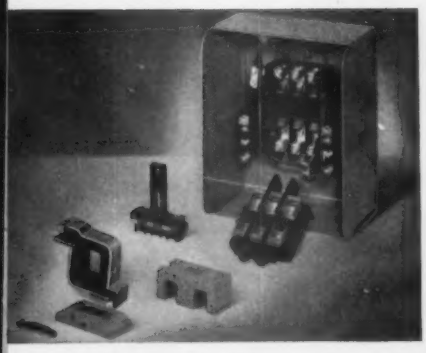
SNAP-SLIDE CONSTRUCTION makes possible complete disassembly of the starter in 20 seconds. Contacts can be removed and inspected in ten seconds.

STRAIGHT-THROUGH WIRING means no wires need be bent or looped, and all wiring is done from the front. Pressure-type terminals and 10% more wiring room speed installation.

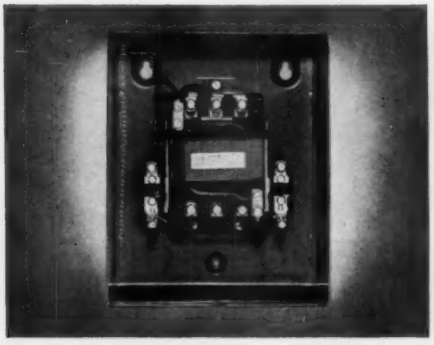
For more information, contact your nearest General Electric Apparatus Sales Office or Distributor, or write Section 733-45, General Electric Co., Schenectady, N. Y. (Ask for Bulletin GEA-6917.)

RUGGED DEPENDABILITY of new General Electric Size 2 starter is proved by severe plugging-duty torture test.

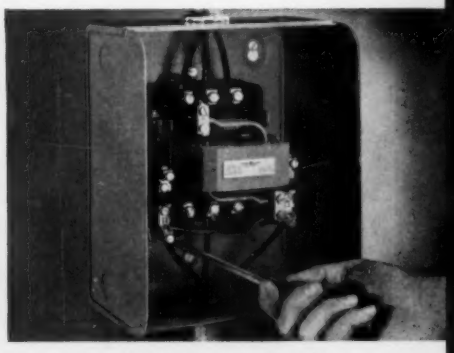
GENERAL ELECTRIC



SNAP-SLIDE CONSTRUCTION permits complete starter disassembly in 20 seconds without tools. All operating parts either snap or slide together for maximum accessibility.



10% MORE WIRING ROOM makes the new Size 2 starter easier to wire, even though it is 14% smaller than previous enclosed forms. Wrap-around cover adds extra accessibility.



STRAIGHT-THROUGH WIRING with line terminals on top and load terminals on bottom saves wiring time. All wiring is done from front, and no wires need be bent or looped.

"Hold it---I'll have this new QHT

dry-type ready in a second!"

You'll save time and money every time you install a new General Electric QHT* dry-type transformer.

QHT dry-type transformers give you, in every rating, in every application, a balanced combination of small size, lightweight, superior installation features, high-temperature insulation and quiet operation. This combination means easier installation and practically eliminates the major sources of dry-type transformer complaints, noise and insulation failure.

Installation is easy with the new dry-types because the units are built with convenient knock-outs, large terminal compartments and wiring spaces which are easily accessible from the front. Lifting provisions are made for units weighing more than 65 pounds. These new transformers can be located at the load which eliminates the need for long, costly low-voltage feeders. No vaults, barriers, or ventilating fans are required.

A new insulation system—QHT dry-types have silicone impregnated insulation, highly moisture resistant, with an inherent ability to withstand high operating temperatures. Combined with materials such as aluminum conductors and cold-rolled grain-oriented silicon steel, you get a smaller, lighter, quiet dry-type transformer designed for years of service.

The new transformers are quiet—All have sound levels equal to or less than NEMA Standards. The rigid welded design of the units helps eliminate lamination vibrations, and on the larger units, built-in rubber mountings reduce noise transfer through conduits and mounting brackets.

Complete stocks of the new transformers are available at local electrical distributors. Single-phase units are built for applications through 167 kva and three-phase ratings are available up to and including 500 kva.

It will pay you to investigate how you can save on installation costs, get customer satisfaction, and be competitive, with General Electric's complete new line of quiet QHT dry-type transformers. Section 411-8, General Electric Company, Schenectady 5, New York.

*Quiet, High Temperature dry-type transformers.

GENERAL ELECTRIC

SECTION B411-8
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SCHENECTADY 5, NEW YORK

Please send me the new Buyers Guide, GEC-1047.

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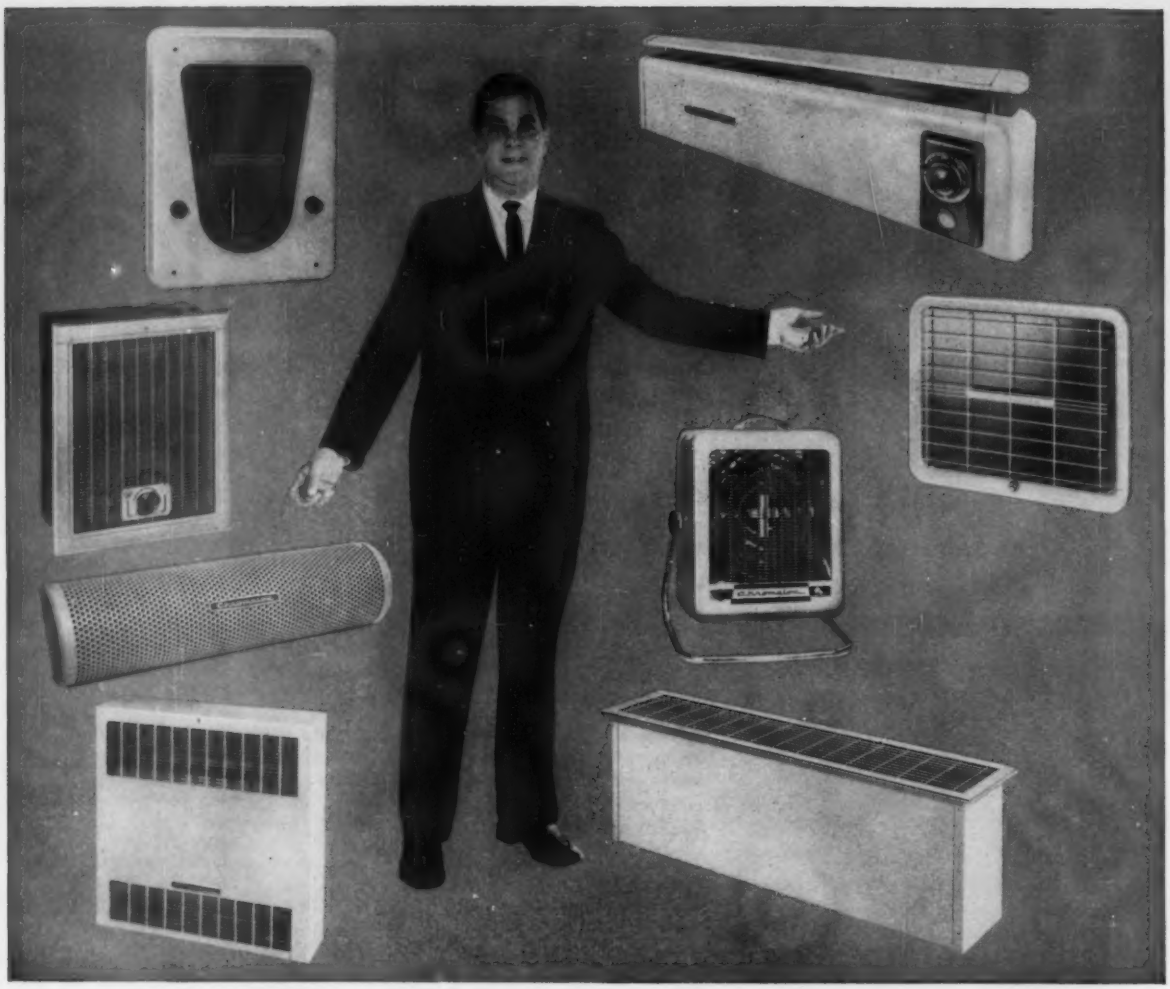

New house? Old house?
. . . for every room in any house
CHROMALOX has the answer

Upstairs, downstairs, all through the house . . . or school, church, motel or office . . . there's a Chromalox Electric Heater *designed* for the heating job.

Chromalox Electric Baseboard Heaters are available in many sizes and ratings, with matching blank, corner and trim sections for a uniform appearance.

Chromalox Radiant Wall Panels, Wall Insert Heaters and Cabinet Convector Heaters provide abundant heat to meet a variety of other heating requirements and decorating tastes.

Chromalox Floor Drop-In Heaters quickly stop heat loss caused by "picture" type windows.

LIVE BETTER . . . HEAT ELECTRICALLY

Chromalox Utility Spot Heaters and Portables concentrate heat where and when it's needed for laundries, workshops, garages and other small, occasional-use areas.

In addition to all these, the Chromalox line includes unit ventilators, fan driven heaters, Thermwire heating cable, in-duct heaters, and others. Chromalox offers you: good profits, customer satisfaction, nation-wide distribution, and local Chromalox engineering assistance. Write now, or call your Chromalox "Man with the Answers."

4979

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Electric Heat
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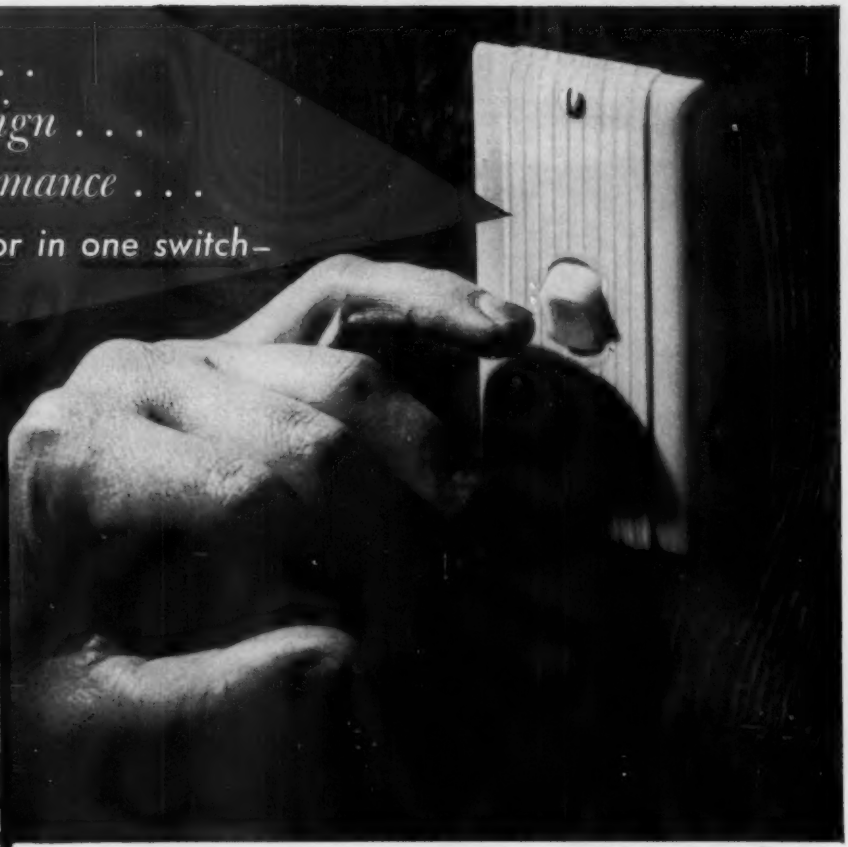
7637 Thomas Boulevard • Pittsburgh 8, Pa.

the beauty . . .
the design . . .
the performance . . .
you've hoped for in one switch–



Push It, Press It, Roll It, Rock It

No matter how you choose to operate the new ROCKER-GLO, the merest brush of a finger produces instant action . . . and *ROCKER-GLO glows in the dark!* The switch that *looks* right, *feels* right and *is* right for every type of wiring job.

the new P&S® ROCKER-GLO SWITCH

After intensive testing, Pass & Seymour proudly presents ROCKER-GLO . . . the one switch that answers all your needs.

A switch that is trouble-free and packed with eye-appeal.

ROCKER-GLO does the job of all types of switches. It combines toggle action and press action with luminous and quiet features that answer all individual customer needs.

You can tell when it's on or off.

Rocker-Glo — *The Specification Grade Switch*

AVAILABLE in Despard interchangeable type, Despard type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts A.C.

Send for brochure on Rocker-Glo Dept. ECM-659

P&S

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In Canada; Renfrew Electric Limited, Renfrew, Ontario

DIRECT BURIAL OF TRIANGLE TRIOPRENE RR CABLE gives low-cost trouble-free systems

It wouldn't be a good practice to bury any RR cable directly in the earth where mechanical damage might cause an outage. BUT, in practically all other situations involving voltages up to 5000 volts, contractors and engineers are finding this versatile power and lighting cable pays off in installation savings and trouble-free service.

Protected by a Trioprene sheath, Triangle's special neoprene compound, RR Cable is flexible, lightweight and tough. It has good aging and heat resisting properties, and is designed to give long-time trouble-free service. It's easier to handle, splice and terminate than metallic sheathed cable. Its first cost is less, and it requires neither conduit nor ductwork under most conditions. In addition to direct burial, RR is also suitable for aerial and duct installations.

Find out more about this versatile power cable.
Write for a copy of the Triangle RR Cable folder.

Buy right—buy from your distributor

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

DEPENDABLE ADHESION • PROPER STRETCH • EASY TO USE

EVERY splice you make must be *final*, *permanent* and *safe*. SLIPKNOT PLASTIC TAPE is engineered for *dependable* adhesive quality and *proper* stretch to insure a neat, tight wrap that molds to any irregular shape and *stays down*.

And Slipknot's patented, exclusive cutter, packed free with every 66-foot roll, solves the handling problem — swiftly, handily, easily. No waste ... no distortion ... no effort.

Next time, *specify* SLIPKNOT PLASTIC ELECTRICAL TAPE from your distributor.

TAPES BY
SOLD ONLY THRU RECOGNIZED WHOLESALERS
PLYMOUTH RUBBER COMPANY, INC.

PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 CANTON, MASSACHUSETTS

Makers of SLIPKNOT FRICTION TAPE ... most widely used [illegible] tape in the world

Sports lighting requires a combination of short-range and long-range floodlights to provide good visibility for participants and spectators, and to add dramatic effect. Economical Revere Eliptor floodlights on Revere hinged poles illuminate this race track. Revere "2000" Series long-range, rear-serviced floodlights are mounted on the grandstand roof to increase intensity of illumination at the finish line.

Solve any outdoor lighting problem with Revere's complete, matched line

Peak lighting efficiency for any outdoor lighting application calls for a number of components, each designed to do a specific part of the job. Solving outdoor lighting problems is much easier when you install Revere equipment because—

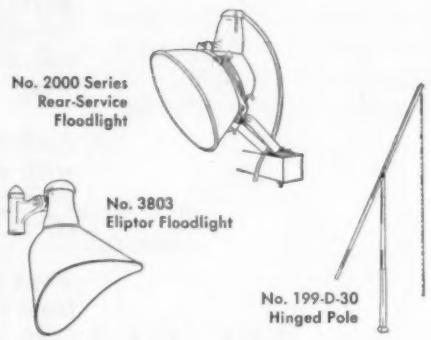
1. Revere offers the widest line, making it easy for you to select the exact combination of components to solve *any* outdoor lighting problem. Everything you need from one reliable source simplifies ordering, assures on-schedule delivery of all components.

2. Revere offers matched components . . . *structurally* matched for strength, balance, and perfect fit; *design* matched for peak lighting efficiency and best appearance.

3. Revere offers easier installation—lights, poles and accessories are made for each other. Installation is fast, easy, trouble-free.

Write for Revere's catalog of outdoor lighting equipment. You can solve any outdoor lighting problem with this complete, matched line.

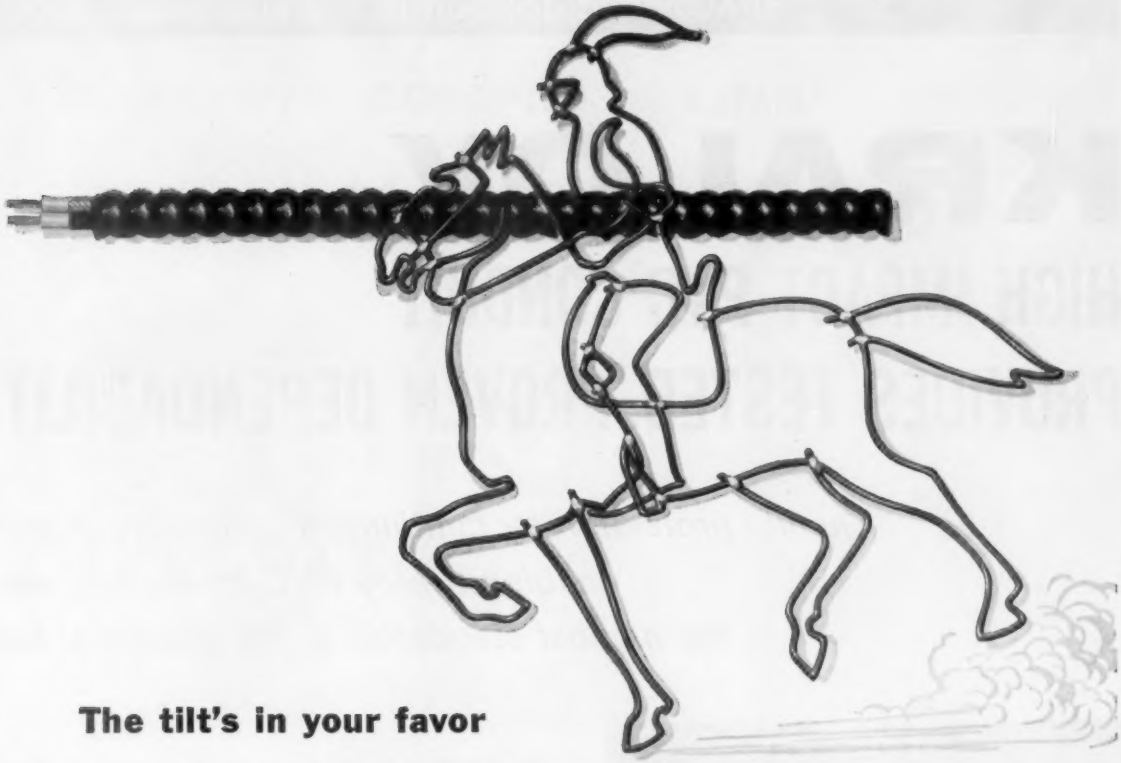
Revere components used to light race track



Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

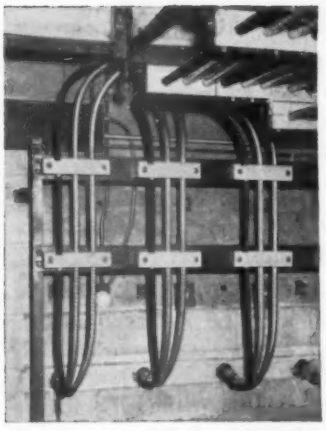
Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (In suburban Niles)
Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles
In Canada: Curtis Lighting, Ltd., Leaside, Toronto, Ontario



The tilt's in your favor

when you use CONDEX

the new color coded armor



New, color-coded Simplex aluminum CONDEX interlocked armored cables permit maximum efficiency and flexibility in plant layout planning, and they make installation and maintenance easy.

Simplex CONDEX, with armor of galvanized steel, aluminum, bronze, or stainless steel, can be applied over cable cores of up to 4" or more in diameter.

In many thousands of installations, Simplex CONDEX has proved its flexibility, and its great resistance to crushing and mechanical damage. Operates efficiently even in extremes of climate and temperature. Write for detailed specifications folder.

Simplex

LIVE BETTER ELECTRICALLY

WIRE & CABLE COMPANY

79 Sidney Street, Cambridge 39, Mass.

KRALOY

HIGH IMPACT PVC CONDUIT PROVIDES TESTED, PROVEN DEPENDABILITY

Quality protection by continuous laboratory control enables Kraloy PVC conduit to meet the highest standards of the electrical field

KRALOY PVC Conduit is precision extruded from basic compounds ideally suited to electrical needs. Engineered to the most exacting specifications and produced under rigid quality control, KRALOY PVC Conduit is unexcelled for both communications and power applications. A trial installation of KRALOY PVC Conduit proves its unequalled efficiency.

KRALOY introduces an entirely new concept of electrical conduit efficiency that provides safety, dependability, low cost and enduring life. Rigid testing and inspection of KRALOY PVC (Polyvinyl Chloride) Conduit opens the door for today's most modern, economical, trouble-free applications of conduit for the electrical industry.

Note the matchless features of Kraloy PVC conduit:

NO Rusting	Will NOT Support Combustion
NO Pitting	Strong...Permanent
NO Corrosion	Needs NO paint,
NO Condensation	NO Coating, NO Lining

KRALOY is *the perfect answer* to age-old conduit troubles. Now you can have long life, high impact, rust-proof and safe electrical conduit installations at low cost when you specify KRALOY PVC Conduit. And KRALOY Conduit is easily installed with a minimum of tools.

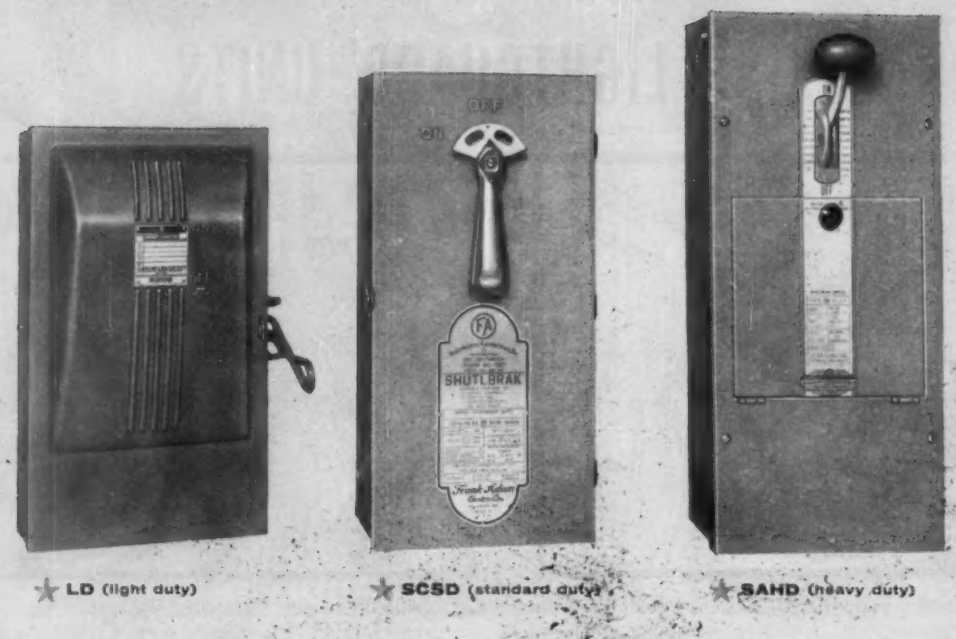
For complete details and information, write for brochure on Electrical Conduit—Kraloy Plastic Pipe Co., Inc., Dept. EC-6, , 4720 East Washington Blvd., Los Angeles 22, California.

KRALOY PVC Conduit is sold only through wholesale electrical supply houses.

K-59-4

NOTHING PIPES LIKE KRALOY

NOW, A COMPLETE LINE
of all 3 types!



★ LD (light duty) ★ SCSD (standard duty) ★ SAHD (heavy duty)

Dependable FRANK ADAM SAFETY SWITCHES

Now There's a Frank Adam Safety Switch for Every Need!

(Light Duty)	(Standard Duty)	(Heavy Duty)
30 to 200 amperes—240-v., A.C. Indoor and "Raintite".	30 to 200 amperes—240-v., A.C. or 600-v., A.C. Indoor and "Raintite".	30 to 1200 amperes—240-v., A.C. or 600-v., A.C. Indoor only, flush or surface mounting.

Regardless of the installation requirement—light, standard or heavy duty—there's a Frank Adam Safety Switch to give long-lasting, trouble-free service.

Frank Adam's *new* LD switch—plus the SCSD and SAHD switches—assures you of the same superior engineering and dependable performance on every job, large or small.

For more information see your wholesaler. He's ready to give you off-the-shelf delivery!

See our catalog in SWEET'S

FRANK ADAM ELECTRIC COMPANY
P.O. BOX 357, MAIN P.O. · ST. LOUIS 66, MO.

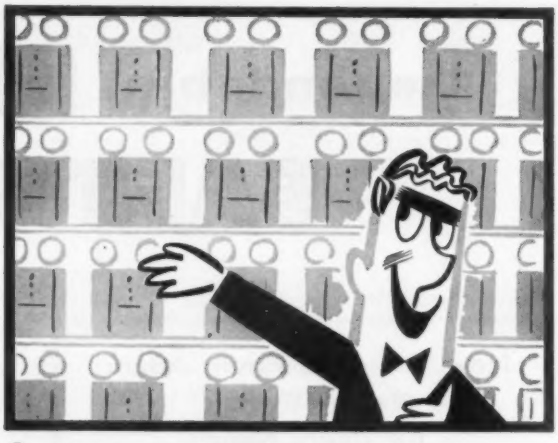
busduct • panelboards • switchboards • service equipment • safety switches • load centers • Quikheter

HOW TO MAKE A MINT OF MONEY SELLING EXIDE LIGHTGUARD® UNITS

1. Find prospects everywhere. Look for buildings with people in them and where sudden darkness could cause injury, damage or theft. This includes nearly all the commercial, industrial and public buildings in your area.

2. Show the Exide Lightguard. Point out that its superior power capacity means more light-hours in the event of emergency. Genuine Exide battery with built-in charger gives years of trouble-free protection.

3. Demonstrate the Exide Lightguard. Plug it into a light socket, then switch off the power. Show how the Exide Lightguard goes on instantly and automatically. Floods an area with light till power comes back on.



4. Ask how many the customer needs. You'll find most users will buy several—one for each area to be protected. Many orders will run to important money. So selling Exide Lightguard units can be profitable business.

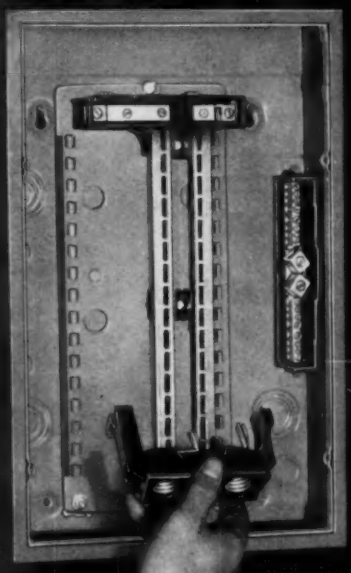
Here's your market:

Every business, factory, office, institution, theater, school, church. If they don't have emergency light now, you can be sure they need it. And they're better off if they buy Exide Lightguard. Why don't you be the one to sell it to them. For information on becoming an Exide Lightguard dealer, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

Uncompromised flexibility begins with an empty box

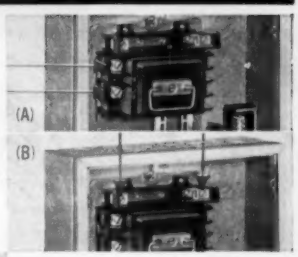
...and a "Stab-in" idea



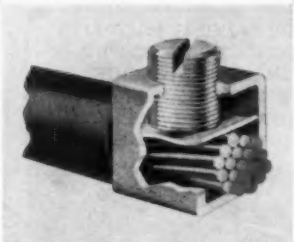
FEDERAL PACIFIC'S NEW TYPE SF FUSIBLE LOAD CENTER LINE—has no fixed circuits ... 10 standard enclosures take the place of 208 separate devices... meet all requirements from 30 through 200 amp main disconnects.

FLEXIBILITY THROUGH STANDARD STAB-IN UNITS
—all 5 are designed on a 1½" module, can be stabbed into simplified bus in any combination, in any position.

ADDED FLEXIBILITY THROUGH DUAL-RATING
—all enclosures are U.L. approved for use as either service equipment (A) or as load centers (B).



PLUS THE FLEXIBILITY OF FLUSH/SURFACE FEATURE
—each Type SF enclosure can be either flush or surface mounted.



MORE FLEXIBILITY THROUGH COPPER/ALUMINUM LUGS
—U.L. approved. Lets you take advantage of low-cost aluminum conductors.

Now contractors can meet all day-to-day requirements with a small investment in 10 flexible enclosures, buying stab-in units as needed. Both are readily available from distributors stock. Write for bulletin 1-215A, Federal Pacific Electric Company, General Offices: Dept. 361, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

ANOTHER ADVENTURE IN LOW-VOLTAGE WIRING WITH

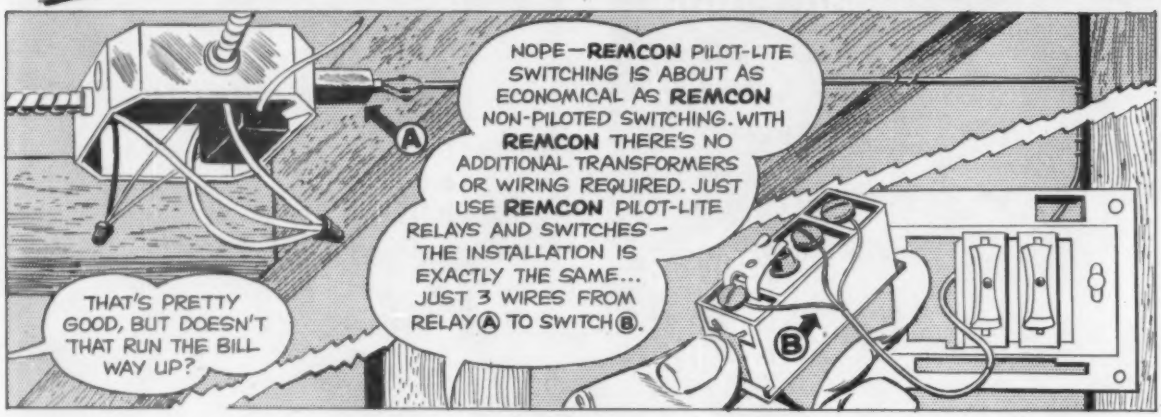
REMMIE REMCON

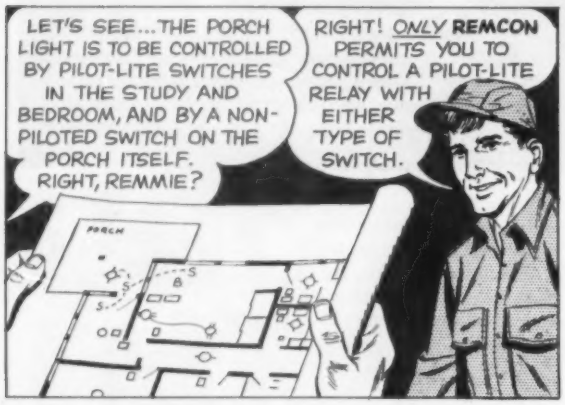
and

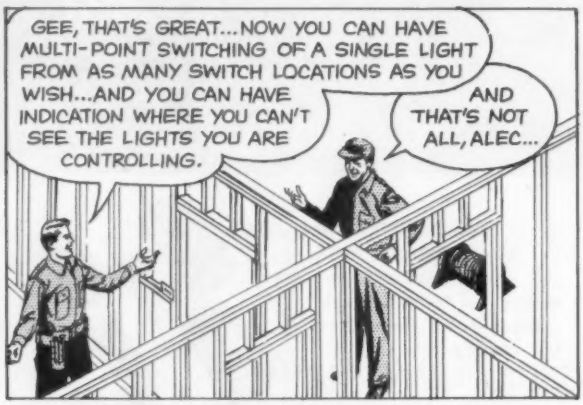
ALEC TRISHUN

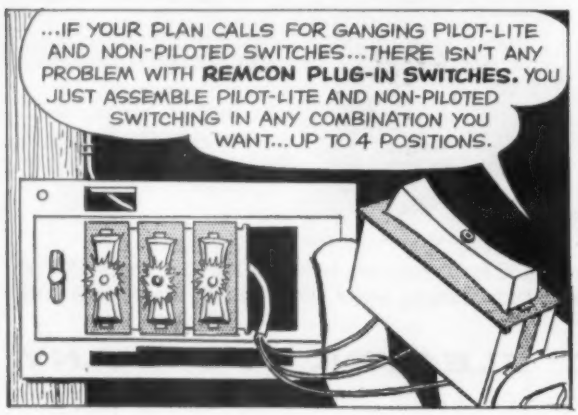
"THE PILOT-LITE PUZZLE"

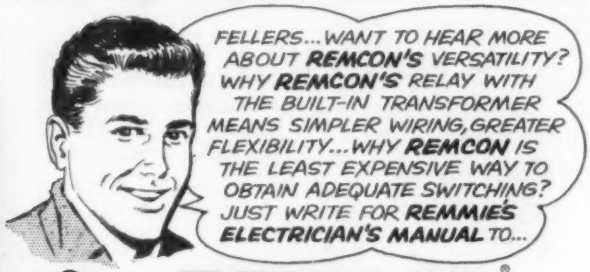
SAY, REMMIE, THIS JOB CALLS FOR THE BASEMENT LIGHTS TO BE CONTROLLED FROM THE **HALL**. WHAT GOOD IS IT GOING TO DO IF THE USER CAN'T TELL IF THE LIGHTS ARE ON OR OFF?
OF COURSE HE CAN TELL. THE TINY RED JEWEL ON THE SWITCH LIGHTS UP WHEN THE CIRCUIT IS ON.


THAT'S PRETTY GOOD, BUT DOESN'T THAT RUN THE BILL WAY UP?
NOPE—**REMCON** PILOT-LITE SWITCHING IS ABOUT AS ECONOMICAL AS **REMCON** NON-PILOTED SWITCHING. WITH **REMCON** THERE'S NO ADDITIONAL TRANSFORMERS OR WIRING REQUIRED. JUST USE **REMCON** PILOT-LITE RELAYS AND SWITCHES—THE INSTALLATION IS EXACTLY THE SAME... JUST 3 WIRES FROM RELAY Ⓐ TO SWITCH Ⓑ.
A
B


LET'S SEE... THE PORCH LIGHT IS TO BE CONTROLLED BY PILOT-LITE SWITCHES IN THE STUDY AND BEDROOM, AND BY A NON-PILOTED SWITCH ON THE PORCH ITSELF. RIGHT, REMMIE?
RIGHT! *ONLY* **REMCON** PERMITS YOU TO CONTROL A PILOT-LITE RELAY WITH EITHER TYPE OF SWITCH.
PORCH


GEE, THAT'S GREAT... NOW YOU CAN HAVE MULTI-POINT SWITCHING OF A SINGLE LIGHT FROM AS MANY SWITCH LOCATIONS AS YOU WISH... AND YOU CAN HAVE INDICATION WHERE YOU CAN'T SEE THE LIGHTS YOU ARE CONTROLLING.
AND THAT'S NOT ALL, ALEC...


...IF YOUR PLAN CALLS FOR GANGING PILOT-LITE AND NON-PILOTED SWITCHES... THERE ISN'T ANY PROBLEM WITH **REMCON PLUG-IN SWITCHES.** YOU JUST ASSEMBLE PILOT-LITE AND NON-PILOTED SWITCHING IN ANY COMBINATION YOU WANT... UP TO 4 POSITIONS.


*FELLERS... WANT TO HEAR MORE ABOUT **REMCON'S** VERSATILITY? WHY **REMCON'S** RELAY WITH THE BUILT-IN TRANSFORMER MEANS SIMPLER WIRING, GREATER FLEXIBILITY... WHY **REMCON** IS THE LEAST EXPENSIVE WAY TO OBTAIN ADEQUATE SWITCHING? JUST WRITE FOR **REMMIES ELECTRICIAN'S MANUAL** TO...*

REMCON®

A DIVISION OF

PYRAMID INSTRUMENT CORP.-Dept. B2

630 MERRICK RD.

LYNBROOK, NEW YORK

Balance... the measure of cable superiority

Every brand of cable *must* have certain important electrical characteristics. But not every brand will have these characteristics in the *same* relative proportions... and it's this fact that makes a difference in cable life and performance. Look at these significant test results.

	BRAND			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	—50	—45	—90	—50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

Note how, in Brands A, B and C, there is a marked lack of *balance* between abrasion resistance and ozone resistance. This means that these cables can crack long before they wear out. Also, it is quickly apparent that needlessly high cold flexibility may be built into a cable... *but at the sacrifice of more important electrical properties.*

But Carol cable, in addition to having the highest *combined* rating, is also the best *balanced*... with primary emphasis on the characteristics most vital to cable life and performance. The *balance* built into Carol cables is your assurance of superior quality *throughout*... *extra* quality and performance where it is most needed.

When you call for cable—call for Carol!

PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

Neoprene-jacketed Anaconda cable shrugs off 9 years across lime bed

Back in 1950, Wyandotte Chemical Company didn't have to bury or string up cable when they put in power for their Grosse Ile brine pumps. They just laid a 5 KV Anaconda Durasheath cable above ground. That it would lie over a bed of lime waste was of no concern, since the cable was neoprene-jacketed. Today, after exposure to weather extremes and alkalies, the neoprene is still providing dependable, trouble-free service.

The known performance of neoprene led to its use in this installation. Neoprene had a time-proven reputation for resistance to chemicals, moisture and weather.

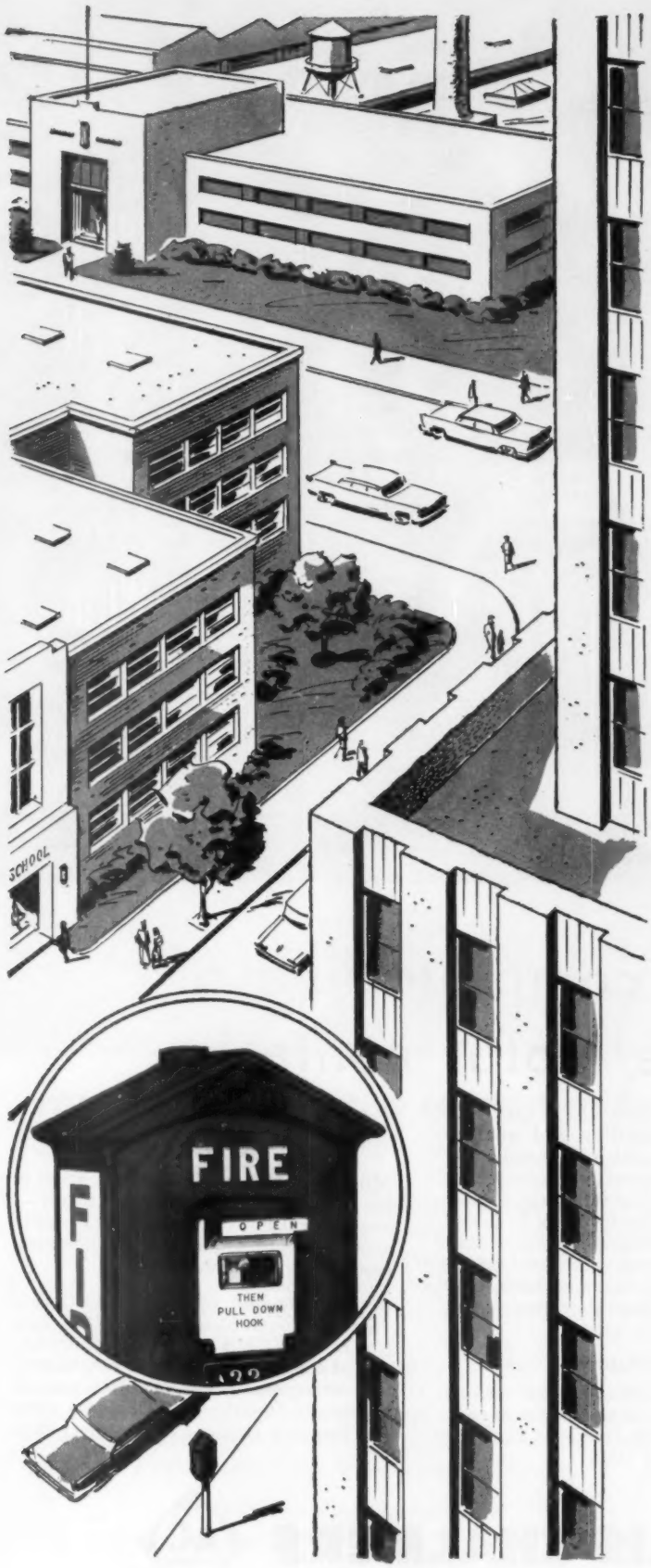
Over 20 years of uninterrupted service in many installations give you assurance of long-term economy when you specify neoprene on wire and cable. For details, write to E. I. du Pont de Nemours and Co. (Inc.), Elastomer Chemicals Dept. EC-6, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

Better Things for Better Living . . . through Chemistry



Put PROVED dependability into interior FIRE ALARM systems!

You can provide today's *best* fire alarm protection for any industrial, commercial, or institutional building with a Gamewell FLEXALARM System. Thoroughly pre-engineered by the fire-protection professionals who developed the familiar "pull" fire alarm box, it assures the same unmatched efficiency and dependability *inside* buildings.

Precisely tailored to each installation, FLEXALARM is available as a coded or non-coded system, semi or completely automatic, with practically limitless possible combinations of annunciators, special drill, test, and alarm features. For example, it can be tied into the municipal alarm system at the curb; integrated with the sprinkler system; or automatic fire detection devices.

FLEXALARM is designed for unit-by-unit expansion depending on specific life hazards, fire defense plans and the growth of your plant. It's simple to specify, easy to install, efficient and economical. Gamewell will be happy to assist with fire detection engineering of new construction, expansion, or modernization, if desired. It's a service that gives you the benefit of over 100 years' experience with fire protection systems. Specify Gamewell . . . single source for engineering assistance and complete product line . . . maximum protection at minimum cost. Write THE GAMEWELL COMPANY, Dept. 8A, Newton Upper Falls 64, Mass.

Gamewell

FIRST...WHEN SECONDS COUNT

WIDE OPEN for Fast Wiring and Inspection

NEW complete line of low voltage motor control

Wide-open accessibility and modern design assure fast and easy installation, modification, inspection and maintenance of this new line of Size 0 through 4 Allis-Chalmers control. For instance, large and clearly marked terminals, pressure connections for all wiring, wide and deep-cut screw slots, clearly visible contacts, easy coil replacement, readable rating plates, "out-front" overload relays.

Flexibility

This new line of control permits making many modifications in the field with ease. Minimum parts requirements facilitate delivery from local stock.

Unsurpassed Mechanical and Electrical Life

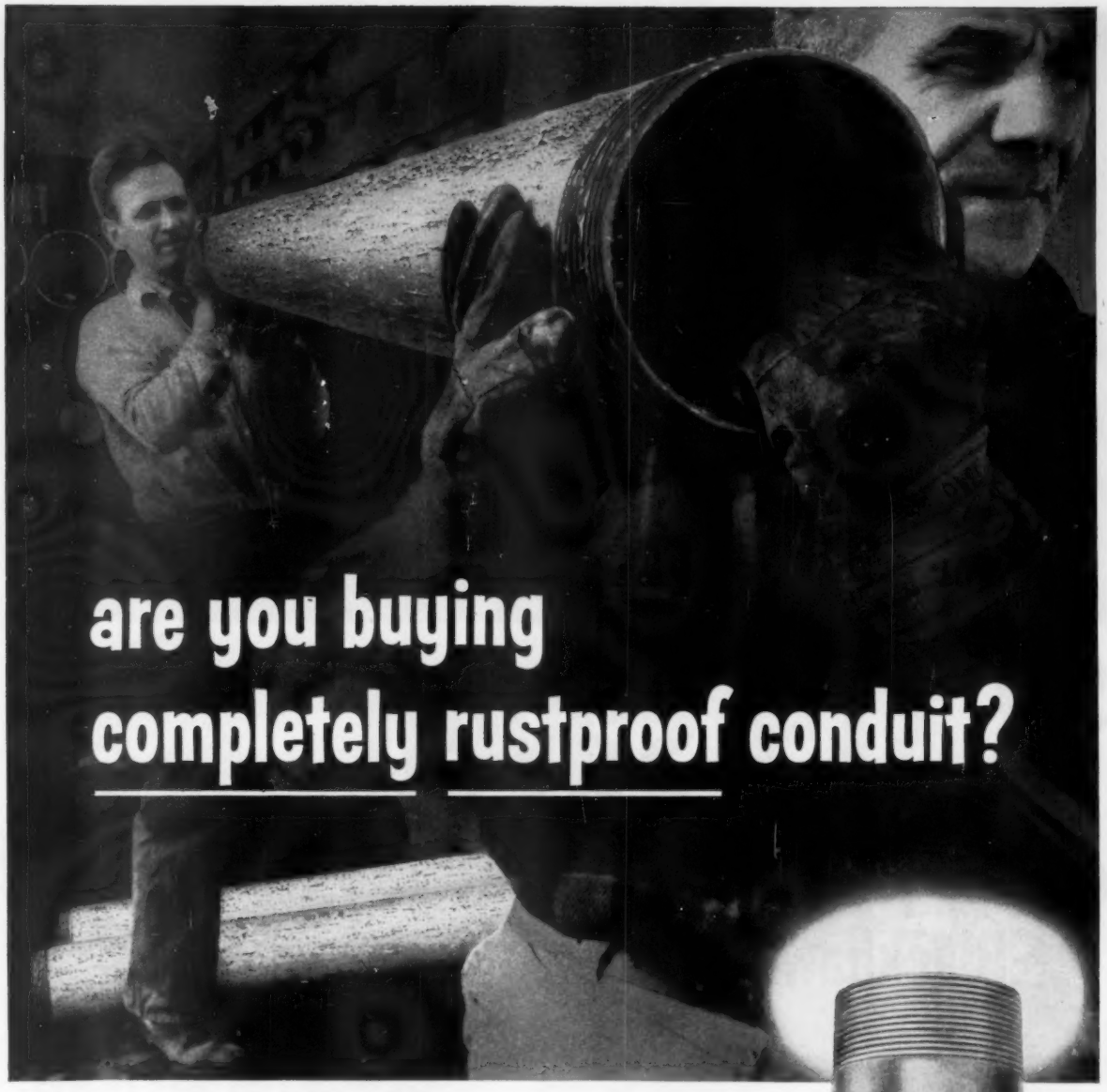
Millions of "life-test" operations attest to the functional quality in every detail — assure the ultimate in dependable performance and sure protection for personnel, motors and machines.

A complete line of low voltage control (Size 0 through 8) and high voltage control *in all NEMA* enclosures, plus engineered control systems. Your A-C distributor or representative will give you all the details. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

Plan to stay ahead... MODERNIZE!

ALLIS-CHALMERS

A-5984



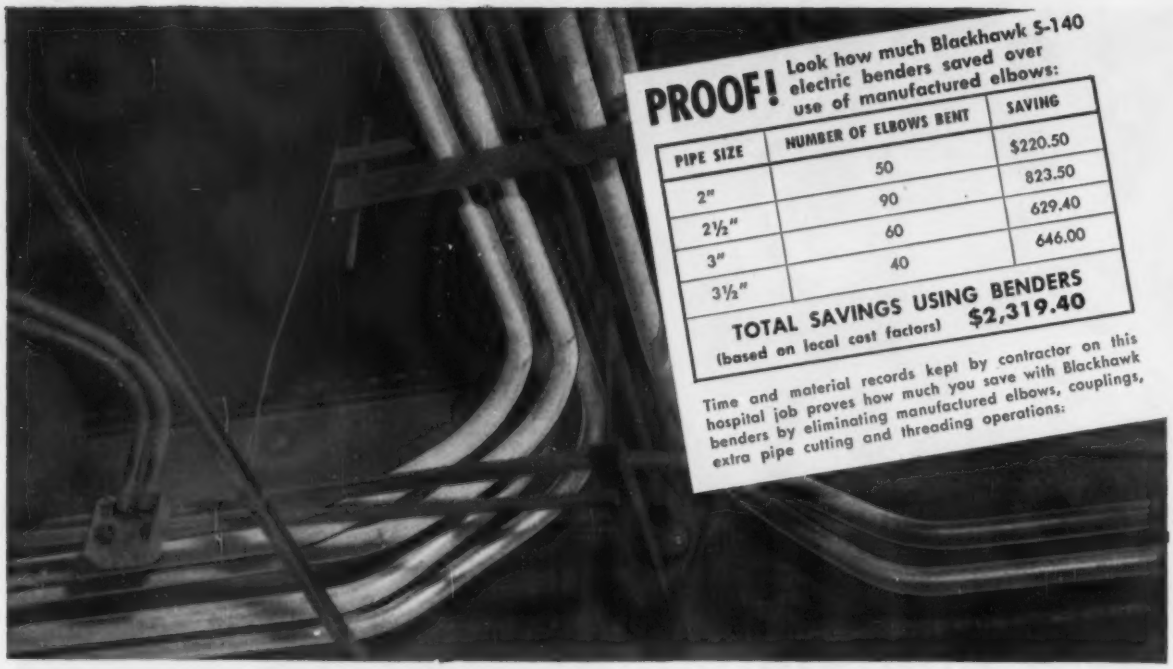
PITTSBURGH STANDARD HOT-DIP GALVANIZED CONDUIT IS RUSTPROOF FROM END TO END

The zinc chromate coating that characterizes Pittsburgh Standard Hot-Dip Galvanized Conduit doubles the protective life of the galvanizing. And the hot-dip galvanized and coated threads stay bright, clean and sharp. No chasing or cleaning required even when conduit lies in storage for months. All thread protectors are color-coded for easy size identification.

For ease in handling, Pittsburgh Standard conduit is banded into master lifts, and the individual bundles of each size are identified by color-coded bundling tapes. All these features are yours at no extra cost when you buy Pittsburgh Standard. Ask for them at your electrical distributor's. *Pittsburgh Standard Conduit Company, Verona, Pa.*

PLANTS AT VERONA AND MORRISVILLE, PA.

RIGID STEEL CONDUIT · ELECTRICAL METALLIC TUBING · ELBOWS · COUPLINGS · FITTINGS



PROOF! Look how much Blackhawk S-140 electric benders saved over use of manufactured elbows:

PIPE SIZE	NUMBER OF ELBOWS BENT	SAVING
2"	50	$220.50
2½"	90	823.50
3"	60	629.40
3½"	40	646.00
TOTAL SAVINGS USING BENDERS (based on local cost factors)		$2,319.40

Time and material records kept by contractor on this hospital job proves how much you save with Blackhawk benders by eliminating manufactured elbows, couplings, extra pipe cutting and threading operations.

$2,319 saved

on one job with "one-shot" Blackhawk Benders

On just one Midwest hospital pipe bending job, this contractor saved $2,319 over the cost of purchased elbows and couplers by using 4" Blackhawk S-140 electrical benders!

Now, thanks to the brand new Blackhawk P-550 2-speed electric pump — your opportunities to save are *even brighter!* Why? Because the new P-550 electric pump teamed with a Blackhawk featherweight aluminum "one-shot" bender cuts bending time to 50% of that required by any other bender! Then you're set for *low-bid, high-profit* business during the coming construction rush!

NEW! super-fast 2-speed pump will break even more records!

- P-550 workhorse is 50% faster than any other electric pump!
- Two-speed action — fast approach to load . . . twice the speed under load!
- *Starts safely* under full load!
- Safest, quietest, most powerful portable electric pump on the market!

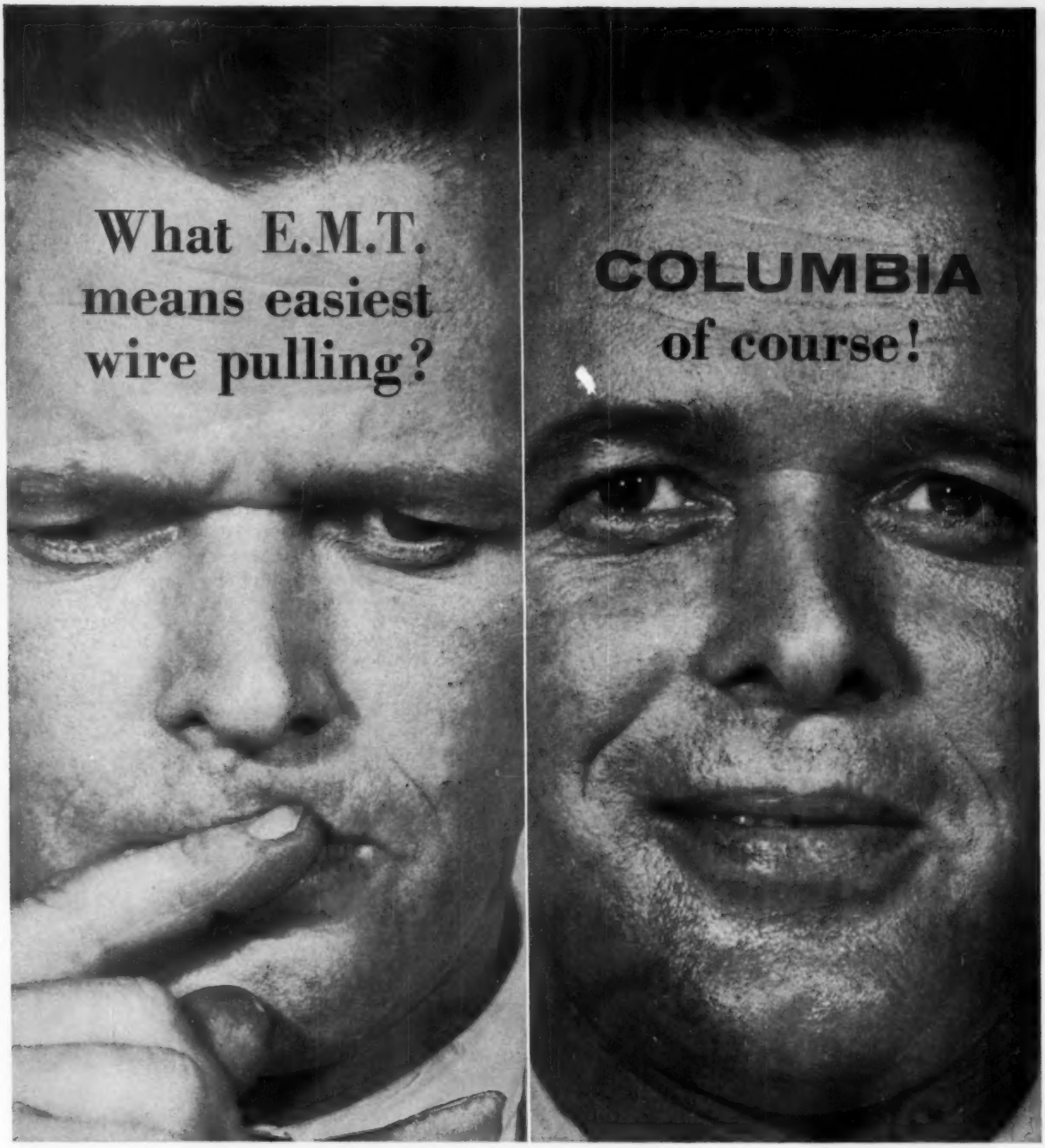
Ask for TRY-BEFORE-YOU-BUY Demonstrator Kit!

Here's your big chance to try a "one-shot" Blackhawk bender and P-550 pump on-the-job. A golden opportunity to compare before you buy . . . to actually see how much more profit you can make on every job. You pay as you profit! Many distributors are offering interest-free extended terms . . . up to six months to pay!

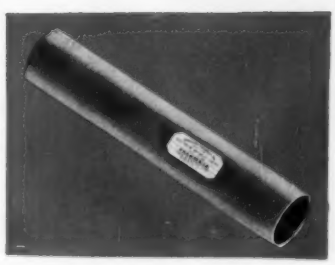
BLACKHAWK®

BLACKHAWK MFG. CO., H-2069, MILWAUKEE 46, WIS.

"World's Most Complete Line of Hydraulic Tools"



...E.M.T. with an inside finish that speeds wire pulling... proven to take less effort! An E.M.T. so uniform that you get clean-looking, kink free bends every time. As for durability, everyone knows that Columbia E.M.T. has a maintenance-free lifetime finish to satisfy the toughest customer. And we mean satisfy.



COLUMBIA CABLE & ELECTRIC CORP.
255 CHESTNUT STREET • BROOKLYN 8, N.Y.

Porter® VINYL TAPE

Unqualified approval by Westinghouse Refrigeration Division!

Porter Vinyl Tape has been tested to meet the tough Westinghouse specification for use in new refrigerator-freezer combinations, and has received unqualified approval on every point.

Westinghouse rated tapes on the following points: Breaking strength • Adhesion • Low- and high-temperature properties • Staining • Moisture-resistance • Elongation • Odor • Dielectric strength • Effect on polystyrene—and Porter met the spec's on every count!

Special new winding and slitting techniques keep Porter Vinyl Tape from telescoping on the roll, and help save space in tight spots where compact winding is essential. Another feature is its self-extinguishing property—it will not support combustion.

Get complete information by writing *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

THERMOID DIVISION **PORTER** **H.K.PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

WORLD'S MOST WIDELY USED ELECTRICAL TEST INSTRUMENTS

AMPROBE®

THE ONLY LINE THAT COVERS ALL YOUR TESTING NEEDS

The original pocket size snap-around volt-ammeter-ohmmeter

AMPROBE RS-3

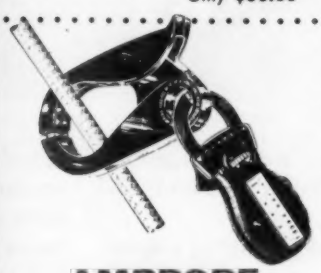
5 current ranges. 3 voltage ranges. Ohmmeter specially designed for the maintenance field. Rotary scale for faster reading and greater accuracy. Pointer-Lock "freezes" pointer at reading. Advanced printed circuitry laughs at rough handling. Advanced movement design uses internal core magnet with self shielding characteristics. By itself, the Amprobe RS-3 handles 99% of your test needs. With the Amprobe Deca-Tran and Amprobe Energizer it covers EVERY testing situation. *Only* $52.50

AMPROBE RS-1

The economy snap-around volt ammeter with many features of the great RS-3 including rotary scale, pointer lock, printed circuit, and advanced movement design. 4 current ranges. 2 voltage ranges. *Only* **$39.85**

AMPROBE JR.

The advanced voltage tester that gives you current, too. Available in seven models, ranging from 10 amps to 100 amps in either 125/250 or 150/600 volts. Choose the model that fits your job. *Only* **$19.85**



AMPROBE DECA-TRAN

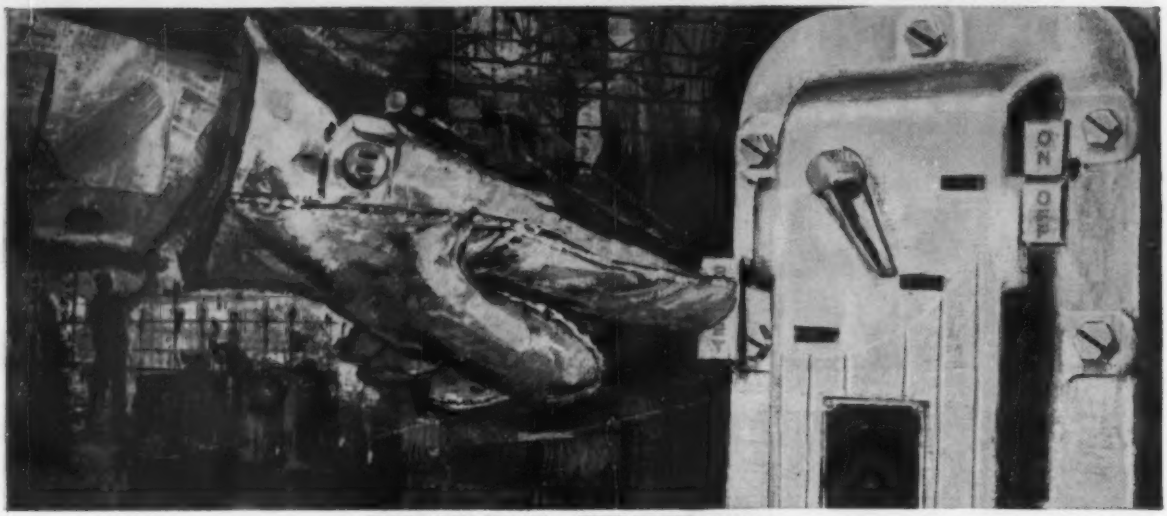
Makes your Amprobe the world's most flexible and versatile electrical test instrument. Extends amperage reading 10 times. Gets readings as high as 1200 amps. *Only* **$24.75**

AMPROBE ENERGIZER

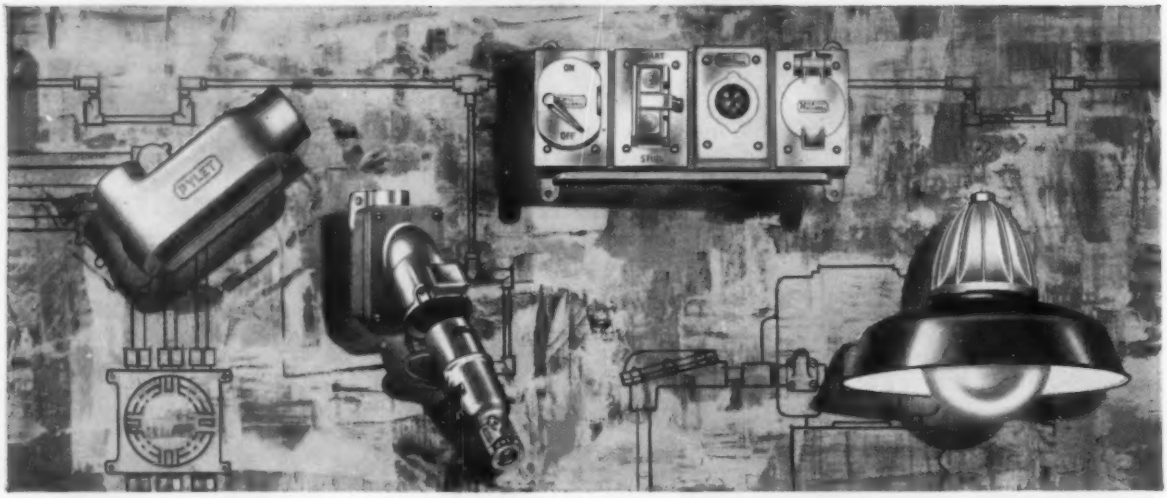
Multiplies the sensitivity of any Amprobe ten times—for precise readings on small appliances and fractional horsepower motors. *Only* **$3.75**

PYRAMID INSTRUMENT CORPORATION, LYNBROOK, N. Y. WORLD'S LARGEST MANUFACTURER OF SNAP-AROUND VOLT-AMMETERS.

For protection of wiring and equipment



you can rely on PYLETS®



PYLET conduit fittings, circuit controls, lighting fixtures and connectors are second to none for quality and dependable service.

Built-in, environment-resistant features exceed code requirements, to meet the exacting demands of industry today—for both hazardous and non-hazardous locations. Cast metal fittings with taper tapped hubs, smooth roomy interiors and cadmium plating insure economical installation and maintenance as well as long service life.

Specify PYLETS. Sold Nationally through Authorized Distributors.

THE PYLE-NATIONAL COMPANY
WHERE QUALITY IS TRADITIONAL

1344 North Kostner Avenue, Chicago 51, Illinois

Connectors • Conduit Fittings • Circuit Controls • Lighting Fixtures • Floodlights

Branch Offices and Agents in Principal Cities of the U.S. and Canada
Railroad Export Department: International Railway Supply Co., 30 Church St., New York 7, N.Y.
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DIVISIONS: Multi-Vent, Air Distribution • Steber Manufacturing Company, Lighting

58TH YEAR • JUNE 1959

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Light and Heat

Higher values of illumination in offices and stores can result in a heat input of significant importance. As footcandle levels rise the energy consumed in the lighting system increases proportionately. And as we learn more about high level lighting application we shall probably sacrifice even more lumen per watt efficiency to achieve better control of brightness. In any event, the heating effects of lighting systems are posing problems which may cause radical changes in installation practice.

For fluorescent lighting, it takes about 1 watt per square foot for each 20 footcandles from typical modern lighting systems. Values as high as 100 footcandles are not uncommon today. Values of 200 to 300 footcandles are considered feasible with existing equipment and even higher levels have been produced comfortably in experimental installations.

At 200 footcandles the heat input to the lighted area is 10 watts per square foot, a heavy load for air conditioning, and, in some applications, probably enough to provide a major part of the winter heating requirements. It is necessary, therefore, to remove as much heat as possible from the equipment to lighten the burden on air conditioning systems and, alternately, to employ the energy usefully for space heating.

One system that has been suggested involves sealing off the ceiling above the translucent diffusers to isolate the fixtures from the air conditioned space. The ceiling plenum is then cooled with forced ventilation. Automatic dampers would re-direct the heated air into the space below for winter heating.

Modern research in illumination has indicated that current practice still falls far short of providing ideal lighting conditions. The range beyond 100 footcandles is already being explored and practical installations of 200 and 300 footcandles will certainly come in the near future. At these levels it is quite possible that heating may become an important by-product of the lighting system.

Wm. T. Stuart

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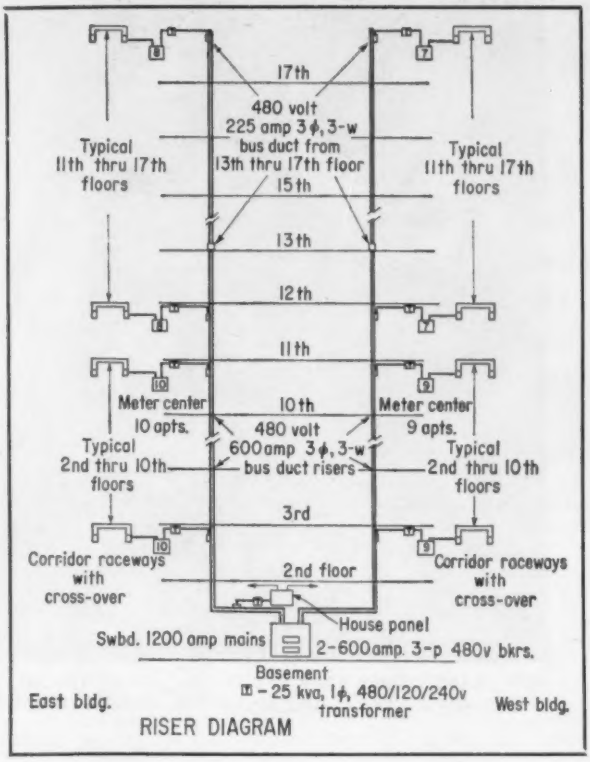


RISER DIAGRAM

RISER DIAGRAM of new 480-volt, 3-phase primary and 120/240-volt secondary distribution system in existing 17-story building.

Gain Economy on

High-Rise Apartment Building Rewiring

by installing . . .

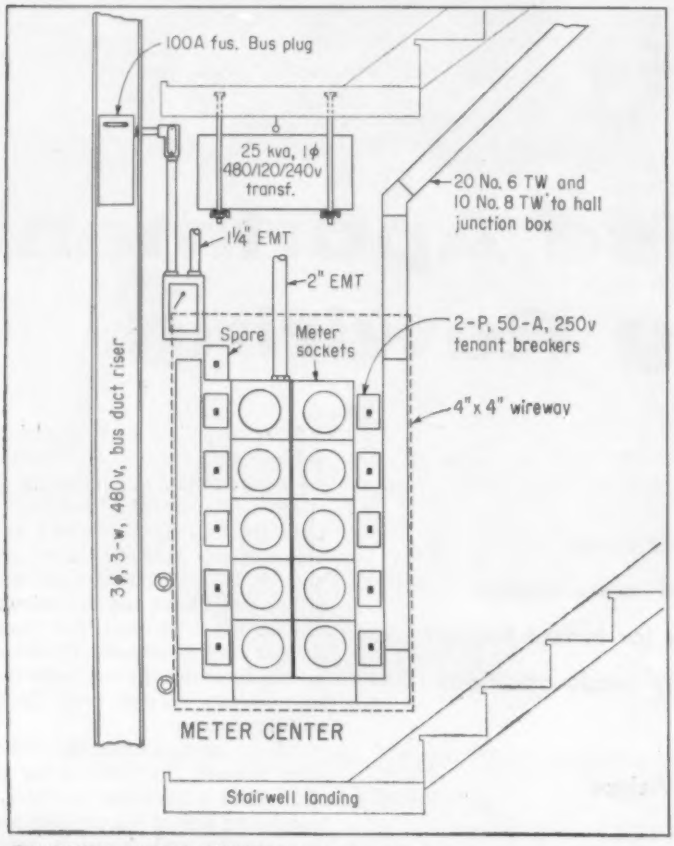
- 480-volt, 3-phase bus duct risers
- Stairwell transformers and meter centers
- Corridor surface raceways for tenant feeders
- Apartment surface raceway circuit additions

By Stanley C. Wielgos
Engineer-Estimator
Premier Electrical Construction Co.
Chicago, Illinois

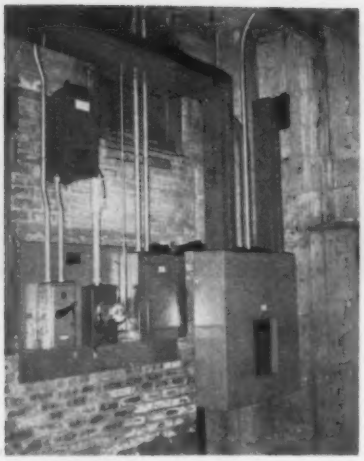
NEW electrical service and distribution facilities at Patrician Apartments, an existing 17-story 276-apartment building on Chicago's north side, boosts available capacity from 192 to approximately 997 kilowatts. Application of bus duct risers and extensive use of surface raceways for tenant feeders and apartment circuit additions kept installation costs to an economically feasible level for the building owners.

After management decided to offer tenants electric cooking and room air conditioning facilities, it took a long look at the existing service capacity and found it totally inadequate for anticipated loads. Rewiring was the obvious answer

NEW TRANSFORMER BANK in back alley provides 480-volt, 3-phase service to building. Two existing services (one shown in rear) will be disconnected.


100A fus. Bus plug
25 kva, 1φ 480/120/240v transf.
1¼" EMT
2" EMT
Spare
Meter sockets
20 No. 6 TW and 10 No. 8 TW to hall junction box
2-P, 50-A, 250v tenant breakers
4" x 4" wireway
3φ, 3-w, 480v, bus duct riser
METER CENTER
Stairwell landing

STAIRWELL METER CENTER details, showing typical arrangement of riser duct, step-down transformer, socket meters, tenant breakers and secondary wireway to corridors.



MAIN PANEL in basement has two 600-amp breakers for east and west bus duct risers. Transformer, meter and panel at left are for "house" service.

to the problem. Electrical consultants found that building size, structural conditions and kilowatt demand met Commonwealth Edison Company standards for 3-phase, 480-volt service and riser distribution. An added incentive for this voltage choice was the utility program of furnishing the necessary step-down transformers and primary circuit breakers for tenant-metered installations of this size.

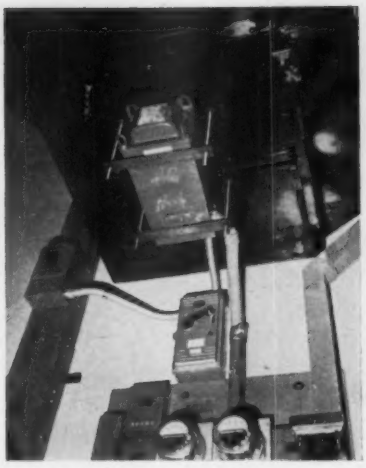
Close collaboration between the consulting engineers and Premier Electrical Construction Co., project electrical contractor, led to layout and installation refinements resulting in a saving of more than 20% of the initial estimated cost. Because of the well-coordinated design and installation procedures, rewiring was accomplished with minimum interruption to tenants and building service and with a minimum of plaster wall channeling, patching and repainting.

480-volt Risers

System design centers around a single 1200-amp, 3-phase service to replace the two existing 400-amp, 120/240-volt, single-phase services which fed the two wings of the building. While new ampere capacity is 1.5 times that of the original total, doubling the voltage and shifting to 3-phase distribution increases the old kilowatt capacity by a factor of 5.19.

Three-phase, 480-volt service is carried by nine 500MCM type

BUS DUCT RISER goes up 17 floors in open shaft of enclosed stairwell; provides 480-volt, 3-phase power to each floor. Conduit at left of duct carries No. 3/0 bare conductor for secondary system and equipment ground.



STEP-DOWN TRANSFORMER at each floor is suspended from stair landing by pad-lined hangers. Single-phase, 25-kva, quiet-type unit is fed by bus-plug (left) and breaker (below); secondary goes to meter center below.

TYPICAL METER CENTER in east wing stairwell contains apartment socket-meters, tenant main breakers and secondary feeder raceway.

RHRW cables in three 3-in. conduits from an alley transformer platform to a basement main service board with 1200-amp mains and two 600-amp, 3-pole circuit breakers. Each breaker feeds a run of 600-amp, 3-phase, 480-volt bus duct. One run goes to the east wing stairwell where it rises 17 floors in an unobstructed shaft adjacent to the stair landings. The other run goes to and up the west wing stairwell adjacent to the landings in a similar manner.

Riser bus duct is conventional plug-in type (with aluminum bus bars) adapted to vertical feeder application. The factory-altered duct has special bus supports to take care of the cumulative bus bar weight problem encountered in high vertical installations. The sheet-steel bus enclosure has only one predetermined opening per floor for a conventional fused bus plug at each stair landing.

To facilitate bus riser installation, Premier mechanics first mounted continuous-channel supporting brackets, at 5-ft intervals, on the clear west wall of the stairwell shaft. Supplementary angle-iron weight-brackets were welded to the steel stair platform at every fourth floor. The bus duct was installed section-by-section from the first floor up. An electric winch at the shaft base, with a steel cable over a skylight sheave, hoisted and held each section in place while it was bolted to the brackets and connected.

At each stair landing, a 25-kva, single-phase, quiet type, dry-type transformer steps down the 480-volt distribution to 120/240 secondary voltage level. All of the 32 transformers (16 per wing) are suspended from the under side of the landings by two trapeze hangers. Raising the 430-lb units in position between the pre-installed hanger rods presented a problem because of the limited confines of the stair landings.

Premier engineers solved it by mounting transformers immediately after the bus risers were installed. Mechanics used the same winch setup; shifted the skylight sheave over the center of the stair landings; drilled a hole ($\frac{3}{4}$ in. in concrete; $\frac{1}{2}$ in. in steel base) in the center of each landing; threaded the winch cable through the holes down to the first floor. Transformers had been pre-spotted at each landing after being brought up in the freight elevator.

The cable was wrapped around the transformer in short-sling fashion and secured by a U-bolt. As the winch raised and held the transformer against the landing, mechanics added the trapeze cross channels with a vibration-absorbing pad between channel and transformer. After the unit was lowered on the channels, ratchet wrenches were used in the 3-in. clearance above to release the U-bolt. The cable was then pulled up to the next landing where the procedure was repeated.

Stairwell Meter Centers

Tenant metering on each floor is centered at a socket-meter board installed directly under the transformer at each stair landing. Primary service (two-No. 4's in $1\frac{1}{4}$-in. EMT) to the transformer is through a 100-amp, 2-pole circuit breaker (required and furnished by the utility) mounted some $6\frac{1}{2}$ ft above the landing and a bus plug higher up on the riser. Transformer secondary conductors (three No. 2/0's in 2-in. EMT) go directly to the meter enclosures. Flexible conduit terminates at the transformer.

A typical meter center consists of a 3-ft by $5\frac{1}{2}$-ft, $\frac{3}{4}$-in. plywood backboard on which are mounted rows of meter enclosures flanked by rows of 50-amp, 2-pole, 250-volt tenant breakers—one per meter. Tenant feeders are enclosed in a 4-in. by 4-in. screw-cover wireway which borders three sides of the meter center and extends up and across the stairwell wall to the main corridor. In the east wing, existing socket meters in closets were relocated to the new stairwell centers.

In the west wing, existing stairwell meter centers were retained in the new design and tenant breakers installed in a corridor closet directly behind the meters. Here, transformers were stair-suspended as close as possible to the meters to cut transformer secondary runs. Primary feeders were carried around the stairwell to the bus duct riser on the opposite shaft wall.

Surface Raceway Distribution

Extensive use of surface raceways for secondary distribution and individual apartment rewiring simplified conductor installation, cutting plaster channeling, patching and redecorating to an absolute minimum.

Each apartment feeder consists of two No. 6 and one No. 8 TW conductors. Multiple feeders from the meter centers are carried down both sides of the main corridors in long runs of 2¾-in. by 1⅞-in. surface metal raceway mounted on the walls of the corridor just above the door frames. Individual feeders drop off at each apartment location. Conductors are easily laid in the channels and enclosed by a snap-in cover.

These corridor raceways originate at a special pull-box integrated with the 4-in. by 4-in. wireway coming from the meter centers. Dual surface raceway cross-overs at this junction tie-in with the runs on the opposite corridor wall.

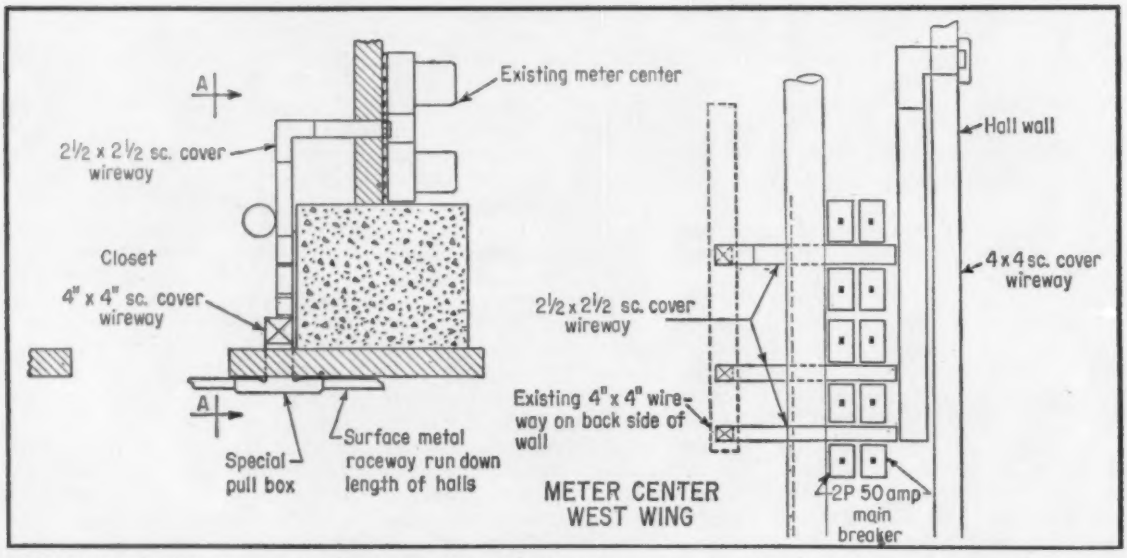
In general, 1¾-in. by ⅞-in. surface metal raceways were used inside the apartments to carry tenant feeders from the corridors to new load centers in the kitchen area and branch circuits to range outlets. While 2-pole breakers are in the panels for air conditioners, circuit extensions to room units are a tenant option and can be easily added later. Where building layout permitted, a single larger raceway carried feeders to two back-to-back apartments.

SQUARE DUCT raceway (4-in. by 4-in. screw-cover) carries tenant feeders across stairwell and through wall to main corridor.

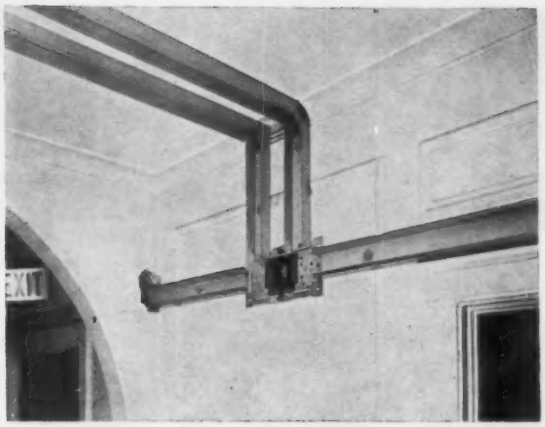
Typical apartment rewiring was confined to feeder extension, new load center installation, range circuit and outlet and one appliance branch circuit, usually in the kitchen. For the smaller units, load centers were of the 8-circuit type with a 2-pole breaker for the range, a 2-pole breaker for the air conditioner, a 1-pole breaker for the existing circuit, a 1-pole breaker for the new appliance outlet, and two spare breakers. In the larger apartments, 12-circuit load centers picked up two existing circuits, adding a range circuit and two air conditioning breakers, an appliance circuit, and provided three spares. Load center panelboards were installed on apartment closet walls where kitchen wall space was not available or where use of the closet made it easier to feed the panelboards of two adjacent apartments.

Pre-Planning Paid Off

Because of their very nature, rewiring projects often present estimating and installation difficulties. Premier engineers eliminated many of these problems by bringing the job into their engineering department via the Polaroid camera. Photographs (on-the-spot, 60-second development) were taken of existing meter centers, stair landing and open shaft spaces, corridor facilities, kitchen arrangements and other areas pertinent to system installation. These, with relevant measurements, were carefully studied for estimating purposes, and later on, for development of detailed shop drawings. Through this approach all concerned—contractor, mechanics, engineer, building management—had a clear cut picture of what was to go where and why. There were no on-the-job confusion and resultant delays. The installation proceeded smoothly and on schedule to the complete satisfaction of all parties.

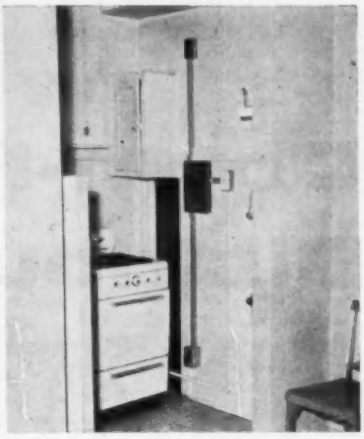

A
Existing meter center
2½ x 2½ sc. cover wireway
Closet
4" x 4" sc. cover wireway
A
Special pull box
Surface metal raceway run down length of halls
Existing 4" x 4" wireway on back side of wall
2½ x 2½ sc. cover wireway
Hall wall
4 x 4 sc. cover wireway
2P 50 amp main breaker
METER CENTER
WEST WING

TYPICAL GROUPING of tenant breakers in corridor closet to tie-in with existing stairwell meter centers on each floor of the building west wing.



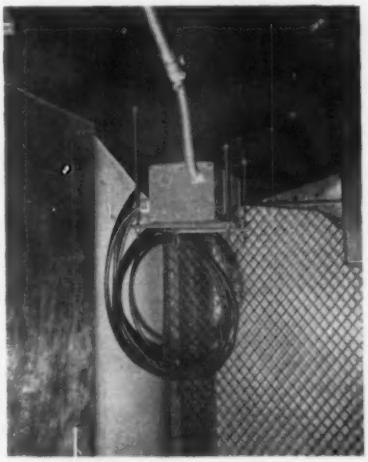
THREE-WAY JUNCTION box on corridor wall connects corridor raceways with meter center square duct. Dual cross-overs go to opposite wall.

SURFACE RACEWAYS run full length of both corridor walls; enclose tenant feeders which drop off at each apartment. Junction box (arrow) integrates meter center wireway.



LOAD CENTERS were installed in apartment kitchens wherever space was available. Surface raceways for feeders and branch circuits simplified rewiring; minimized plaster patching and repainting.

CLOSETS WERE sometimes used for load centers where kitchen space was limited. Large surface raceway carries feeders for two apartments plus branch circuits to adjacent kitchens.



STAIR-SUSPENDED transformers in west wing stairwell were so positioned to feed existing meter centers behind door. Primary feeder goes around stairwell to bus duct riser on opposite wall.

EXISTING METER CENTERS in west stairwell were retained. New tenant breakers were mounted in corridor closet behind meters. Old breaker panel below will be removed.

AERIAL VIEW of new Furniture Mart in Los Angeles shows placement of transformers on roof. Parking lot at left of existing structure provides space for doubling size of present building. Setback section seen rising above main roof level will then constitute service "core" housing elevators and mechanical facilities in penthouse.

Down-Feed Distribution

Roof-mounted transformers and switchgear with downward distribution through square ducts are employed to maximize rentable floor area in Los Angeles Furniture Mart.

By C. J. Bennett, *Consulting Engineer*

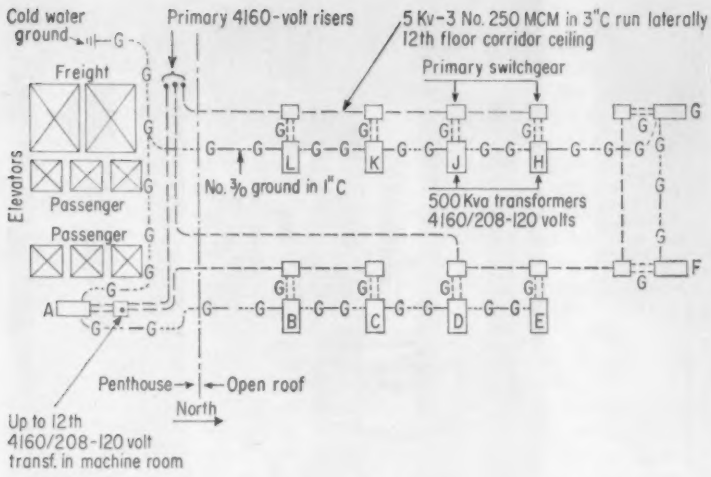
PRIMARY SWITCHGEAR and transformers are mounted on open roof in two rows, being supported by 20-ft-long I-beams that transfer weight of equipment to tops of structural columns.

VIEWING PORTS in door of primary switchgear cubicle permits visual inspection of fused switches without opening enclosures. Signs remind maintenance personnel of voltage level and recommended capacity limit of fuse links. Weatherproof construction and ventilation louvers are features of outdoor equipment housings.

STRUCTURAL features and use considerations in the Los Angeles Furniture Mart building affected electrical design in several important ways: (1) In order to keep all space rentable, it was decided to carry primary 4160-volt feeders directly to the roof; locate a dozen secondary transformers at that level; then carry secondary feeders vertically downward to tiered floor panels and control switchgear.

(2) Due to the elimination of electric closets, it was decided to combine these down-feed drops with local panels to form integrated, continuous assemblies.

(3) Since the absence of closets would prevent bus-duct being installed accessibly, and since the city inspector would not permit concealed use of same, cables were used for secondary feeders.



SCHEMATIC PLAN OF TRANSFORMERS ON ROOF AND IN PENTHOUSE

SCHEMATIC PLAN shows arrangement of primary switchgear and series of 500-kva transformers on open roof and in penthouse, with 5-kv primaries running laterally above 12th floor interior corridors, and with grounding cables extending in conduit to connect with cold water system of building. Transformers are located over tiered distribution panels in building.

(4) Due to the thin-slab construction and the concentration of reinforcing steel particularly around column-slab junctions, it was determined that sleeves and slot-widths be limited to 7 ins.

(5) A square duct was selected as the vertical wireway since it would provide maximum cross-section area, although, under strict code interpretation, it would not be sufficient to contain the desired number of cables (eight 1000-MCM; two per phase and two for the neutral of a 4-wire system).

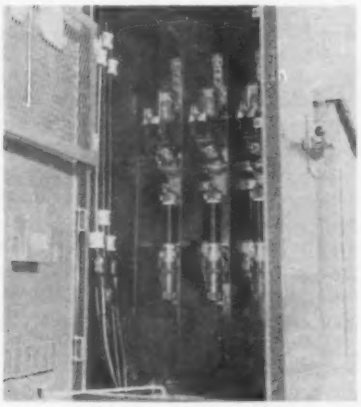
However, since the individual duct sections would be less than 6 ft in length; since they would be perfectly straight, and since they would be open at both top and bottom to induce "stack action" ventilation up through alternate panels and duct sections, permission was obtained to increase allowable "fill" of ducts to 37% rather than a code-prescribed 20%, and to thereby contain the eight cables.

Determination of cable sizes as well as capacities of transformers and primary cables again called for judgment, because, based upon electric demands previously evidenced in furniture marts located in San Francisco and Chicago, it was decided to use a basic design criterion of 7½-watts-per-sq-ft. However, since locations, concentrations and sizes of tenant electrical loads could conceivably vary widely, and since specific layout of tenant space had not yet been formulated at the time of initial design, it was deemed advisable to provide sufficient electrical flexibility so that basic wattage-per-sq-ft could be *quadrupled* (to 30 watts per square foot) for selected areas.

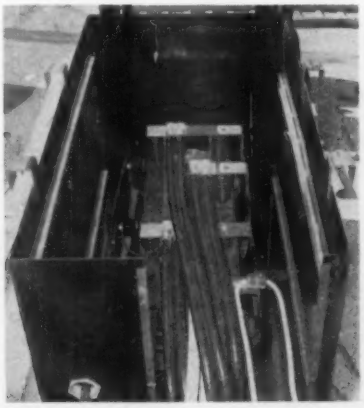
Desire for electrical flexibility likewise dictated installation of 50% more circuits than was considered essential for each 20-by-20-ft bay, while spare capacity in local panels provides another 20% margin for future expansion.

Projecting these capacities backwards through the system, it was then decided to install ten 500-kva weatherproof 4160/208-120-volt transformers on the open roof; an additional indoor transformer of similar capacity in the penthouse, a 500-kva 4160/480-volt unit in the elevator machine room, and a 225-kva 4160/480-volt transformer adjacent to the basement-based main switchboard to serve a power panel in the boiler room.

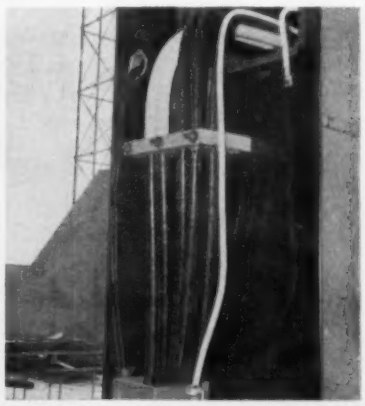
Serving the 12 transformers atop the building called for three primary 5-kv feeders, each consisting



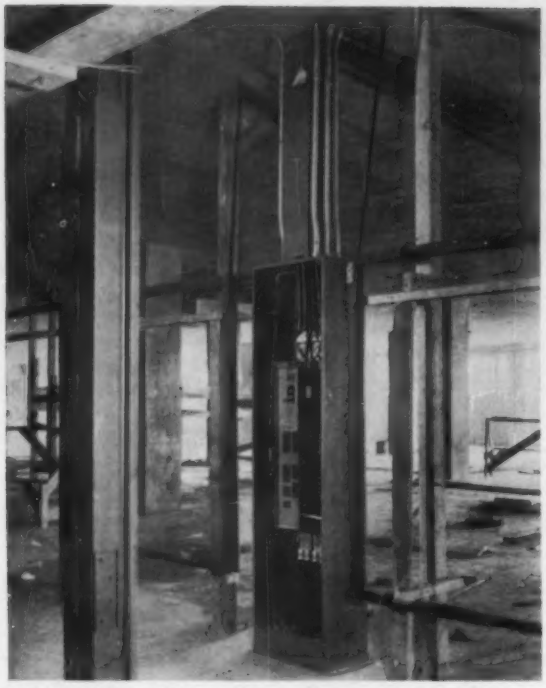
LOAD INTERRUPTION switches in roof-based primary assemblies are equipped with boric-acid-filled power fuses and are group-operated by external insulated handle. Interrupter contacts are arc resistant, are procelain enclosed and are interlocked with switch blades so interrupter unit cannot open until switch blades are sufficiently clear of stationary contacts.



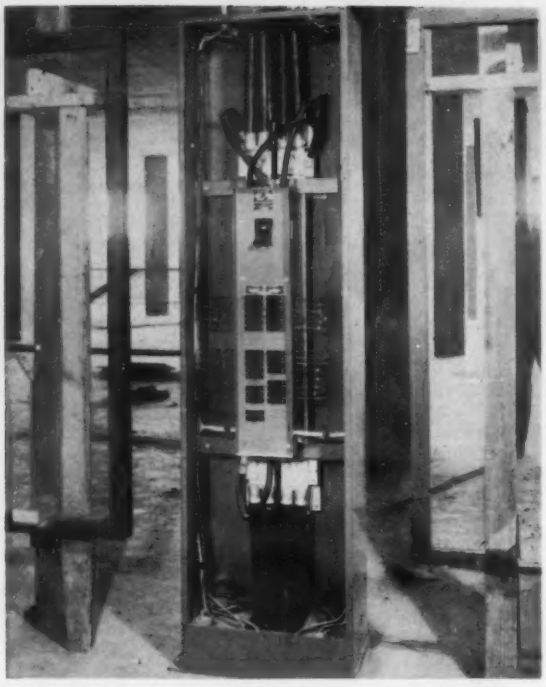
TOP VIEW of opened roof-based distribution transformer shows double-barreled lugs securing 1000-MCM secondary cable and full-capacity neutral to busbar structure. Transformers are Class B dry-type with fibre-glass insulation, glastic barriers between phase windings, and natural air circulation as the cooling medium. White conductors are for grounding.



SQUARE DUCT seen at bottom of transformer-enclosure pull-box section carries eight 1000-MCM cables directly downward to top of distribution panel on 12th floor of building.



CONSTRUCTION VIEW shows arrangement of square 7- by 7 in. duct connecting top of local distribution panel with bottom of similar panel on floor above. With transformers placed on roof and with panels incorporated into walls of interior corridors, maximum rentable floor area was obtained for commercial usage. Branch circuitry for ceiling lighting is carried upwards in rigid conduits that sweep outwards into slab.



CLOSE-UP OF LOCAL PANEL shows top-and-bottom connections between short interconnecting 1000-MCM cable sections and bus structure of switchboard. Conductors were cut to exact length prior to delivery by manufacturer, and double-barreled lugs were installed by bench-mounted heavy-duty hydraulic compressor by contractor on jobsite. Note use of adhesive index labels on branch wiring.

of three VCB 250MCMs in 3-in. conduit, with cable supports located every five floors in liberally-sized (30- by 16- by 11-in.) pullboxes.

The ten roof-based transformers were positioned directly above related tiers of corridor-flanking local distribution panels, thereby making it possible to drop secondary feeder cables vertically downward from low-voltage pullbox sections directly into the previously-discussed 7- by 7-in. duct stacks. Then, in order to transmit the weight of transformers and primary switchgear to the tops of structural columns, cubicles were mounted on 20-ft-long bridge structures consisting of parallel 12-in. I-beams and steel-grate decking.

BASEMENT LEVEL, like upper floors in Furniture Mart, is used to fullest extent for display purposes. Therefore local distribution panels along corridor lines and wealth of column-mounted receptacles were interconnected by conduit runs prior to pouring this initial slab. Unusual size and quantity of reinforcing bars in columns and slabs permitted cross-sections and thicknesses to be minimized.

As indicated by accompanying photos and the schematic plan of transformers, feeders serving each group-of-4 switchgear cubicles are run from the building's service "core," being carried laterally above 12th floor corridor ceilings and sweeping up through large-radius ells to bottom-connect with primary switchgear. Primary ells, secondary square 7- by 7-in. stacks and conduit connections between switchgear and transformer enclosures all pierce the roof slab proper through waterproof concrete pedestals.

Distribution panels throughout the building, set flush with interior corridor walls, measure 10 by 24 ins. in plan with 81-in. heights. And, since floor-to-floor distances average 11½ ft, square stack sections connecting these enclosures

are short enough to justify code modifications for permissible fill.

Stack sections are carried 6 ins. above each finished slab and are flanged out above steel pedestal plates that fit snugly inside panel enclosures. Pedestal plates are held securely in place by double-nutted anchor bolts placed at each corner, and plates are also drilled to receive up-swinging slab-buried receptacle-circuit conduit runs.

Since local panels are equipped with 1600-amp buses, the lengths of 1000MCM cable connecting them together (two per phase; two for neutral) were secured top and bottom by double-barrelled lugs using a special bench-mounted heavy-duty hydraulic compression tool.

As noted, each panel contains a main 225-amp 3-pole breaker at the top; gutters are liberally sized for wiring convenience; all branch circuitry is identified with adhesive labels; distribution panel enclosures and connecting stack sections are welded together to insure continuity of ground, and, in second-floor panels, sub-feeder breakers are installed at the bottoms to provide auxiliary service to tenant space on the main floor and in the basement.

Stack-and-panel risers were discontinued at the second-floor level because basement and first-floor floor-plans were not "typical", therefore lower corridors did not coincide with those on upper levels and, at the time of initial design, layouts for large-area space-allocations (such as a bank and restaurant) had not yet been formalized. As a result, first floor tenants were also provided with direct, metered service from two under-street single- and 3-phase utility vaults. So, as ultimately determined, lower-floor tenants are essentially served through these direct feeders rather than through 2nd floor panels.

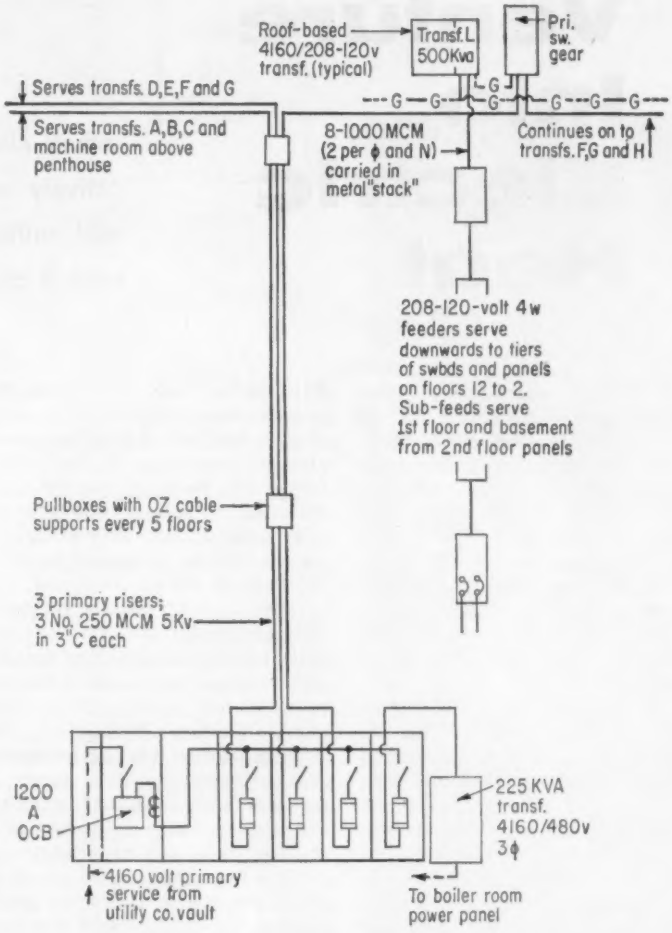
Since most tenants displaying home furnishings wish to create a "home lighting" environment rather than a commercial atmosphere, there was more demand for receptacles (for connection of floor and table lamps) than for ceiling fixtures. Therefore ceiling outlets are generally limited to one in the center of each 20- by 20-ft bay, plus one for every 20 ft of corridor.

Depending upon location and expected load density, branch circuits variously serve one, two or three outlets, with individual circuit loading presently being limited to 1300 watts. Circuits are staggered to balance the load and (again, at present) each phase of each panel is limited to 6000 watts.

To provide for increasing circuit capacity, all branch conduits prescribed as ¾ in. by code were upsized to 1 in., and in no case are branch conduits less than ¾ in.

Credit for the building's general design goes to architects Heitschmidt and Thompson, while electrical planning was by consulting engineer Claire J. Bennett. Structural consultants were Beatty and Clar. The installation was by Stetson Electric, under the supervision of Mike Boyak, while subsequent maintenance of the installed system is being directed by Henry Morin.

PEDESTAL PLATE positioned 6 ins. above rough slab elevation supports top of square duct (which is flanged out for that purpose) and bottom of distribution panel which will rest upon it. Pedestals are held firmly in position by anchor bolts seen at corner positions, and plates are drilled to receive up-swinging conduits carrying receptacle circuits through slab to columns and outside window lines.


Roof-based 4160/208-120v transf. (typical)
Transf. L 500Kva
Pri. sw. gear
Serves transfs. D,E,F and G
Serves transfs. A,B,C and machine room above penthouse
8-1000 MCM (2 per ϕ and N) carried in metal "stack"
Continues on to transfs. F,G and H
208-120-volt 4w feeders serve downwards to tiers of swbds and panels on floors 12 to 2. Sub-feeds serve 1st floor and basement from 2nd floor panels
Pullboxes with OZ cable supports every 5 floors
3 primary risers; 3 No. 250 MCM 5Kv in 3"C each
1200 A OCB
225 KVA transf. 4160/480v 3ϕ
4160 volt primary service from utility co. vault
To boiler room power panel

PARTIAL RISER DIAGRAM SHOWING DETAILS OF SECONDARY DOWN-FEED

PARTIAL RISER diagram shows abbreviated schematic arrangement of main 4160-volt switchboard in basement, primary risers and support-pullboxes in service core of building, lateral installation of primaries to roof-based primary switchgear enclosures, relation of 500-kva 4160/208-120-volt weatherproofed transformers on roof, and vertical secondary feed through square ducts to succession of tiered control panels.

DISPLAY SIGNS calling attention to the electric heat installation are attached to the home where they will be in view of the constant flow of traffic using an adjacent thoroughfare.

AN ELECTRIC KITCHEN is one of the features of the ALL-ELECTRIC wiring job planned and installed by the Service Electric Company. Notice recessed lighting, built-in range and oven, hood fan, master-radio intercom unit, mixer-blender combination, and refrigerator-freezer. Also included but not seen in this photo is an electric water heater, garbage disposal, and washer and dryer.

Venture Into Electric Heat

. . . . A Chicago contracting firm kicks off its electric home heating campaign by actively cooperating with a local builder and utility in sponsoring an electrically heated display home.

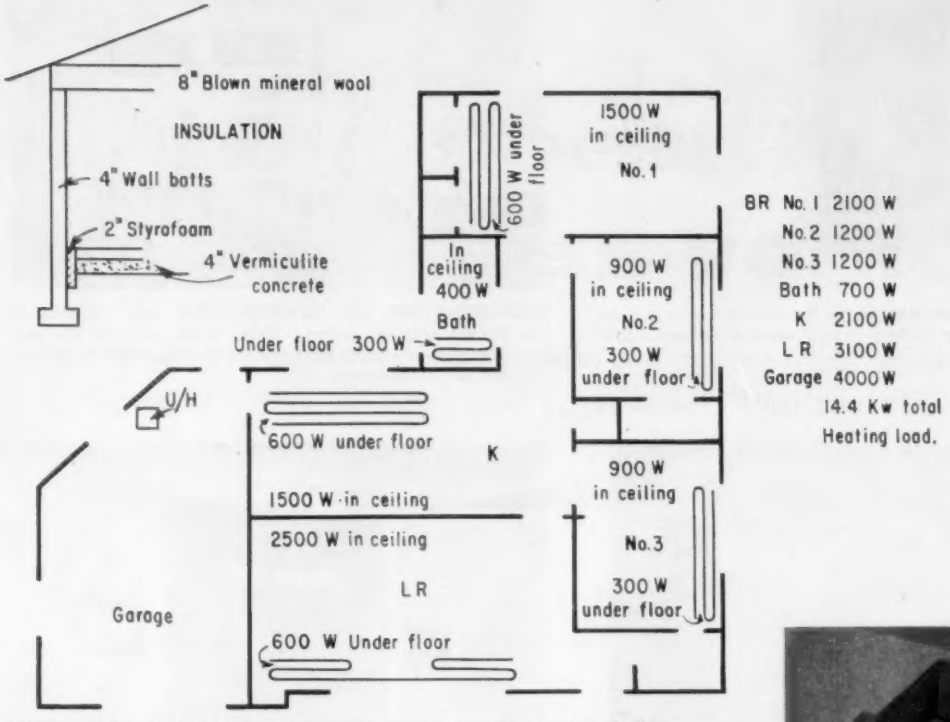
TO THE Service Electric Company, one of Chicago's largest residential wiring contractors, electric heating is here. Ever since last August when the Commonwealth Edison Company (Chicago utility) introduced its new heating rate of 1¾ cents per kilowatt hour, Service Electric officials have been pondering over the opportunities in this newly opened field. But the big question was—how to go about it?

After considering many promotional angles, they decided that the best way to impress a builder was to build something, thus, the idea of sponsoring a well-engineered, electrically heated display house was born. Realizing at once that to carry out this plan by themselves was financially impossible, Service sought the aid of the Commonwealth Edison Company. The utility, anxious to help, agreed to take care of local promotional activity; they also promised to help man the home during inspection hours. The next step was to find a builder willing to partake in the adventure. This proved to be an easy task since Service Electric had facts and figures that proved they could wire a house for electric heating at a price comparable to the costs of the various forced air heating systems available. As an added incentive, and to keep the builder interested, Service Electric Co. promised to install the heating job at their cost.

Chris J. Schulman, a southwest Chicago builder and developer, was quick to take advantage of the plan, and within a few weeks a site was chosen (just a few blocks from Service Electric's home office). The location selected was in a residential area adjacent to a busy thoroughfare where the constant traffic could not help but notice the home and its display signs calling attention to electric heat. Excavation work began at once and in a short period of time the model home was completed.

Since the home was to serve as a promotional model, it was important to provide the builder with unlimited flexibility in his construction designs. For this reason, a radiant cable heating system was selected (also the cost of this type of installation compares more favorably with conventional forced air systems). The embedded cable installation, while eliminating the costs of providing for duct work, a furnace room, and a chimney, leaves each room's perimeter completely free of wall-mounted heating units.

Here briefly are the design considerations Service Electric followed when planning the heating system: (1) An accurate heat-loss calculation was made of each room in order to determine the amount of radiant heating cable to be installed. (2) The amounts and types of thermal insulation that would be required were considered. (3) Ventilation necessitated by insulation had to be determined to reduce moisture in winter and vent warm air in summer. (4) Locating each room's thermostat so that the point selected is on an inside wall and away from outside doors, windows, refrigerator, range, and other non-average temperature zones. (5) The number of degree days during a normal Chicago area heating season were obtained from the U. S.



BASIC FLOOR PLAN details wattages of each room's ceiling and underfloor heating cables. Also noted are amounts and types of insulation installed.

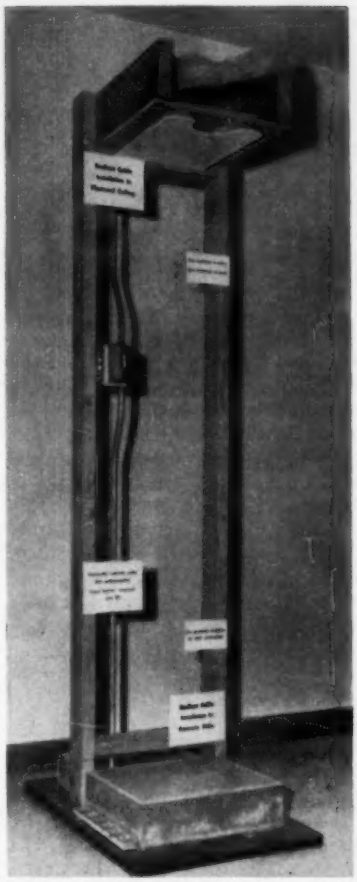
Weather Bureau in order to make an estimate of the home's yearly heating costs.

The next design step necessary before actually beginning the wiring job was to plan and determine the home's lighting and appliance requirements. After combining the calculated heating load with the lighting and appliance load totals, Service Electric decided that a 200-amp, 3-wire service entrance should be installed. The first leg of the wiring job was started. Runs of EMT (Chicago Code) from the centrally located service panel were roughed-in to carry the home's various heating, lighting, and appliance circuits; then the insulation contractor was notified to begin insulating the walls and ceilings.

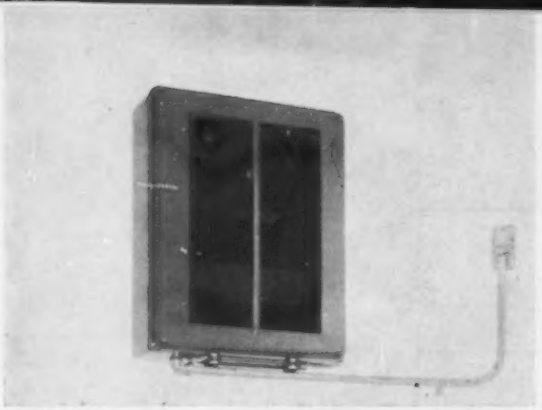
Since Service Electric was to be responsible for the efficient operation of the electric heating system, they specified the amounts and types of insulation to be installed. The following insulation requirements were developed by Service in their original heating design calculations: (a) 8 ins. of blown mineral-wool insulation in the ceilings; (b) 4 ins. of insulation (wall batts) in the walls; (c) 2 ins. of Styrofoam insulation around the edges of the concrete floor slab; (d) a polyethylene vapor barrier, plus 4 ins. of vermiculite concrete mixture beneath the 4-in. concrete floor slab; (e) installation of storm windows and doors.

The 4-ins. of vermiculite insulating concrete was specified because some of the home's radiant heating cables are installed beneath the conventional 4-in. concrete slab. Although the underfloor sections of cables are not entirely necessary to the efficient operation of the ceiling cable system, they serve as a means of providing added comfort by warming the floor and lessening heat loss at critical air transfer areas (see Fig. 1 for locations and wattages). No special thermostats are required for the floor cables since they are connected directly to each room's ceiling cable thermostat.

Service Electric found that the actual installation of the radiant heating cables was easily accomplished by simply following the

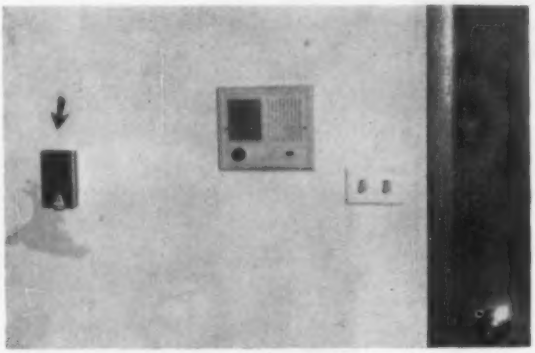


DISPLAY SAMPLES showing cut-away views of the various types of electric heating equipment available were employed throughout the house; the unit pictured here is a scale model of the actual electrical heating system installed by Service Electric Co.

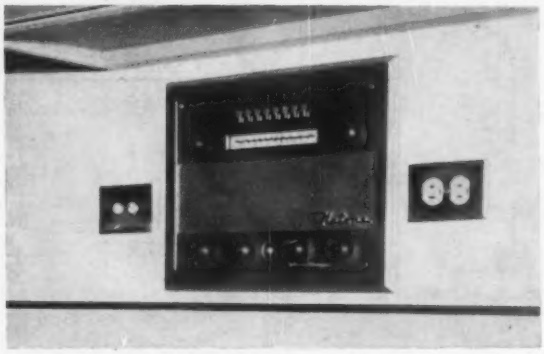


4000-WATT unit heater installed in the attached garage is an added feature of the home's overall electric radiant cable heating system.

PROVISIONS FOR AIR CONDITIONING were included in the home's original design. Wall panels such as the one pictured here (arrow) hides framed out areas built to receive 1½-ton air conditioners.



EACH ROOM is zone controlled by semi-flush mounted thermostats (arrow). The thermostats are sensitive to ½ degree temperature change. Unit pictured on right is one of the built-in intercom stations employed throughout the house to provide communication between all rooms.



MASTER-RADIO INTERCOM UNIT installed in the home's kitchen provides communication between all rooms including the garage and the front door. When not in use for communication, radio programs or music may be piped to the rooms.

heating cable manufacturer's directions. (Almost all electric heating equipment manufacturers have installation manuals available). Here are a few of the more important steps listed in the manual used by Service Electric's electricians. All of these steps were given careful consideration during installation of the entire heating cable system: (1) Spacing of the heating cables. (2) Stapling of the heating cables. (3) Checking room's cable layout at the half-way point. Checking the entire system continuity before plastering began. Then after the system was installed and checked-out these important steps were followed: (1) Notifying local electrical inspector to make his inspection before covering the system with plaster. (2) Cautioning the plaster contractor about the importance of following recommended plastering procedures. (3) Instructing the building contractor as to the proper procedures for drying the plaster. (4) Refraining from turning system on until both coats of plaster had dried thoroughly.

Finally, when all electric work was accomplished, and after the last of the home's finishing touches were added (painting and decorating), Service Electric officials visited the house to make their appraisal of the heating system. To say that they were pleased would be an understatement; in fact their enthusiasm towards the operation of the electrical heating system was so great it prompted them to draw-up the following list which was later mimeographed and added to their electric heating promotional material. The list reads as follows:

No chimney—no flues for hot water heating.

No dirty ducts—no surge of blowing air.

No fuel storage problem—no odor.

No space needed for basement or utility room.

No restrictions on furniture or drapery layouts.

No decorating problems—just clean, quite natural radiant heat.

No maintenance expense and nuisance.

No outside anticipator necessary—thermostats sensitive to ½ degree temperature changes.

No over and under heating during cold windy weather—thermostat zone in every room.

No danger—no chance of explosions or gas leaks.

No added cost for installation over conventional systems.

Provisions for air conditioning the home (should the owner desire it) were also included when planning the wiring job. Wall panels in the living-room and bedrooms hide framed-out areas built to receive 1½-ton air conditioners. Outlet runs to provide power for the air conditioners were installed during the original roughing-in stages of the job.

PART I

Bidding Doesn't Have To Be Guesswork

What is the sequence of making a sale, or completing a job? What constitutes true overhead? How can future work be predicted? What on-the-job records affect cost-accounting? How does one decide whether to bid or not to bid? Here—spelled out in detail for consideration of smaller electrical organizations—are some pertinent answers.

By Rowan C. Brooks, *President, Rapid Electric Service (Professional Estimating) Glendale, Calif.*

IN PLANNING administrative procedures, it is important to realize that there is a definite sales cycle for all contract jobs. In some transactions the sequence may vary or all of the steps may not be obvious. Most jobs, however, include the following steps:

1. Customer contact.
2. Price request by customer.
3. Price submission by contractor.
4. Contract between contractor and customer.
5. Material procurement and transportation of same to jobsite.
6. Installation of materials by contractor's employees.
7. Payment of labor by contractor.
8. Payment of materials by contractor.
9. Billing of customer by contractor.
10. Customer pays contractor.

With these steps occurring over and over, it readily can be appreciated that, even for moderately sized operations, there are far more details than the average man can carry in his head. This suggests that it is essential to have a system for recording pertinent information in an orderly manner, then for reminding management of things to be done at proper times.

Stated in another way, it means that efficient, economical administration leaves practically nothing to memory except routine tasks. Continuous records *must* be kept on all transactions to insure necessary actions being instigated in correct sequence. And only by making these precautions automatic can a contracting business consistently avoid costly omissions and errors.

This generality does not necessarily mean more paper work, but it does mean the establishment of a simple, consistent system in which *every* step is scheduled and recorded.

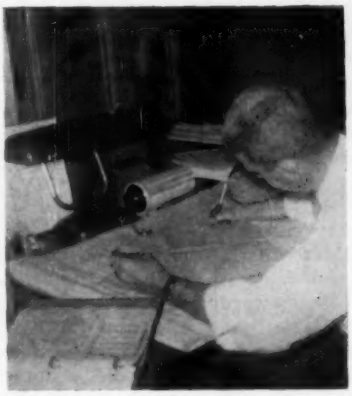
Let us reconsider the ten steps involved in a typical sales cycle, keeping in mind the fact that every step has a reason and that neglecting a step could mean the loss of control, information, or both. These various procedures will be outlined in step-by-step detail, so that those who wish to adopt a proven, effective bidding and pricing system can do so exactly.

1. Original contact: Prepare file card showing customer's name, address, date contacted, how contacted plus any additional data which may be pertinent to either customer or contact.

Place this card in a Suspense File (actually a "tickler" or "date reminder" instrument), entering the card under the date selected for follow-up. This follow-up procedure cannot be overstressed, since it generally is a waste of time to make only a single call, then permitting the contact to grow "cold."

Maintain such cards in a "Prospect" file for personal follow-up calls, direct-mail advertising and for subsequently checking results of sales efforts.

2. Price request: When a request for an estimate is received, first check to see whether the customer has a separate file containing infor-



PREPARING A VALID BID goes far beyond making a physical take-off and estimating labor units, although accuracy in these preliminary operations is essential for successful cost-accounting. Equally important is intelligent scheduling of deliveries, completeness of related paper work and experienced supervision of installation routines.

mation of previous work done for him. Also review the Prospect file, likewise a Jobs-in-Progress file to see whether available manpower might constitute a limiting or deterring factor.

After these various checks have been made, prepare a Bid Request note, holding out the customer's card and notifying the person responsible for making the bid. When this person determines the due-date, it is noted on the Bid note together with all associated information. This information is then noted on the customer's file card, which is replaced in the Suspense file under the date when further action is required.

3. Price submission: Upon receipt of plans or upon inspecting the jobsite, the estimator prepares a preliminary Job Survey form. This is done on every job regardless of its size.

If it is decided *not* to bid the job, this form is filed in a No Bid file for future reference, since this information will provide a valuable record of the nature and amount of work which has been *available*, should the contractor decide to broaden the scope of his operations at a later date.

On jobs which *are* bid, a preliminary estimate is placed in a Bid folder which automatically becomes a Job folder if and when the work is later awarded to this contractor.

Take-off and estimate are now prepared, making sure that every work sheet, pricing sheet, quotation and record of telephone calls pertaining to the bids are filed in this folder. A copy of the actual bid is also filed as the last item.

Necessary data are now entered on the customer record card, which is once more filed in the Suspense file under the opening date of the bids. Or, if there is no opening date, under a date selected by the estimator for follow-up.

Successful Bids

4. The contract: This part of the cycle can occur either through the award of a bid; as the result of negotiations, or simply by the customer calling the contractor and telling him to proceed with certain work. In any instance, a contract (either verbal or written) has been entered into by the parties concerned. At this time, also assign a job number and prepare a Job Card (Work Order). Enter job number on the customer's record card and refile this card. If a bid was prepared, enter the job number on the Bid folder. If no bid was prepared, prepare a Job folder.

Enter in the Job folder a copy of the customer's order and contract. Or, if the order was received by phone, make a complete record of the call, indicating the date and time received, the calling party's name and all instructions received.

In the proper place on the Job folder, enter the estimated time and materials. On non-bid jobs this estimate can be an approximation based upon a description of the work contemplated. Again file the Job card in the Suspense file under the first date that further action is necessary. If the starting date is indefinite, select a date to check on the job's status.

Enter probable manpower requirements on the work calendar.

5. Material procurement and delivery: Jobs other than those done completely from equipped trucks. Prepare material list for all items known to be required. On large jobs this will include a number of lists, each properly timed for delivery-when-required. Order such items as are not to be furnished from stock or trucks, and arrange delivery from suppliers. Make a note indicating expected delivery times and dates, then file this note in the Suspense file for the day *before* the expected delivery. File a copy of all requisitions and purchase orders in the Job file, noting the value of such materials in spaces provided on the folder for that purpose. On the file folder, post a credit for labor allocated to the handling of materials being shipped.

For jobs being done completely from equipped trucks, prepare material requisitions from work reports submitted by workmen on the trucks, and fill these requisitions either from stock or by direct purchase.

Maintain a file, by truck, of all such requisitions. By this method of stock replacement, a periodic inventory of trucks will indicate exactly what stock loss is occurring as a result of materials being overlooked on work reports.

For stock items not purchased for special jobs, tally items from requisitions which have been furnished from stock since last stock purchase; consolidate for the period and order replacement on a periodic basis. An advantage of this general system is that it can be converted to take advantage of machine-operated stock control and invoicing without changing basic procedures.

6. Installation of materials: A complete work report should be submitted for each job, each day, showing materials installed by all personnel on the job, and indicating the status of the job at the end of the day's work. Materials costs on each such report, also related man-hours, are noted on the Job folder. (This procedure permits daily checking of every job's status, thereby alerting the manager whenever a particular job requires special attention to speed up progress.

Each workman turns in a daily time card which is verified against work reports and is also used as a basic record for preparing payrolls. These cards are maintained as a permanent record and are filed by man, and by date.

Using this file in conjunction with the work order file makes it possible to determine quickly and simply where any man was working on a given day, or what men worked on what jobs on any date. Either of these determinations may be required at any time, and many contractors know from experience that searching through records to find this information can be time-consuming and costly. For example, in a recent court case, a large contracting organization (handling over 5000 small jobs a year) was directed to verify where a certain man (no longer an employee of the company) had been working on a specific date over a year previously. Providing this information became an expensive chore which could have been minimized had the above procedure been practiced.

Job Follow-Up

7. Labor payment: Labor payment is generally an Accounting function, so will not be discussed here.

8. Material payment: Like labor payment, this is a general accounting function. However, valuable pre-audit service can be rendered by the assembly and checking of suppliers' invoices in the job system as they are received.

9. Invoicing (Billing): On most jobs, billing is signalized by the work report. When this work report comes in and is posted, a checkmark indicates completion of a phase of the job. The file folder

RAPID ELECTRIC

Estimator M.J. PRELIMINARY JOB ANALYSIS Bid File # JAN 52

Plan Received 1/6/59 Bid due 2:00 P M 1/13/59 Price Bracket $3000 to $10,000

Job location and name 1511 EAST 5TH ST. - GLENDALE - JOHNSON MEDICAL CENTER

Architect JONES Engineer SMITH Customer ELROY & /or OTHERS

After looking over the plans and specifications or after receiving the customers instructions, write here a brief description of the job.

INSTALL WIRING COMPLETE INCLUDING UG SERVICE FOR POWER LIGHTS & PHONES. PROVIDE TEMP SERVICE

APPROXIMATE SCOPE OF WORK

Lighting Service (s) 1 @ 400 Amp 120/240 Volt 4 Panels 4 Feeders 62 Branch circuits

Power Service (s) 3 @ 200 Amp 240 Volt ___ Panels 7 Feeders 35 Total HP 7½ HP Largest

1 @ 400 Amp 240 Volt ___ Panels 2 Feeders ___ Total HP ___ HP Largest

Fluorescent fixtures 80 Incandescent Fixtures 35 Lamps ✓ Floodlights 4 Poles 2

Intercom 0 Public address 0 Bell System YES Phones YES Heaters 12 Fans 12

Air conditioning YES Starters FBO Transformers NO Trenching YES Concrete work YES
UNITS FBO

OUR RATING ON THIS JOB	GOOD	FAIR	POOR	OTHER FACTORS	GOOD	FAIR	POOR
Experience	✓			Plans	✓		
Available Supervision		✓		Architects reputata	✓		
Available labor		✓		Engineer reputation		✓	
Available equipment		✓		Competition		✓	
Available capital	✓			Customer		?	
Labor conditions	✓			Job accessability	✓		
Effect on other work in shop	✓			Profit possibility	✓		

Considering ALL the above factors it will (~~will not~~) be worth our investment of time and effort in preparing a bid on this job. It will take approximately 12 man hours to prepare the estimate of cost.

List below and on reverse side of this sheet any special quotations needed from others, and any special features about this job which have been noted.

QUOTES - FIXTURES, SWBD, PANELS - FLOODLITE POLES - CONCRETE WORK -

NOTE: - FIRE ALARM SYSTEM - BY OTHERS - WE FURNISH POWER AS REQUIRED.

form PE2

WHEN TO BID, and when not to, are questions depending on such related factors as availability of supervision, labor, equipment and capital; experience with the type of work involved as well as with the engineer and architect on the project; clarity of plans, physical location of the work and so on. Knowing when to refuse a job takes courage, discrimination and judgment.

is then carefully checked to make sure that there are no work reports missing, and the invoice is prepared. Certain jobs which have provision for timed progress payments will not have this signal.

To provide billing at the proper time on these jobs, the Suspense file is again used. At the time the job is initially "set up," a note is entered in the Suspense file indicating that "It's time to bill Job Number so-and-so. Progress billing."

A copy of each invoice is filed in Suspense under the due date. This provides an automatic reminder of each bill as it becomes due, and it triggers fast action for collecting bills before they become "stale." Each time an invoice is pulled from the Suspense file, a "Lien expiration note" is placed in the file for three working days prior to the expiration of the lien period.

10. Final payment: From a copy of the bank deposit slip, post the payment to the customer's record card. Remove invoices for which payment was made (also all Lien expiration notices) from the Suspense file. Remove the job card from the Active job file and place in the job folder. File the job folder in the Completed job file.

This general procedure does not include all steps that must be taken. For example, no mention has been made here regarding the problem of permits. Yet this review does indicate the basis of a system that is complete, time-tested, practical, accurate and completely workable. It also provides all information needed for executive decisions.

There is also continuity and consistency in the above system, insuring identical handling of all jobs regardless of the type of work involved, type of contract, or the size of the job.

One prime difference between various types of contracts lies in the actual preparation of invoices. Even on T-M work, it is possible to ship labor credit as a material, thereby providing a check on the performance of workmen. This shipping of labor can also be applied to service men on trucks and can be carried into machine data processing methods at a later date if desired.

This is the first part of a two-part article by Rowan C. Brooks. The second part will appear in the July issue.

Fluorescent Panel Canopy .... *Relights Bank Area*

Wall-supported 6-ft by 64-ft "fixture" provides high-level illumination over main floor office area without detracting from artistic high-beamed ceiling at Standard Federal Savings & Loan Association of Chicago. Tricky supporting structure was fashioned from continuous channel framing members.

By E. C. Anthony, *Electrical Engineer*
Super Electric Construction Company, Chicago, Ill.

A CANOPY of fluorescent lamps now provides comfortable, high level illumination on desks and customer counters of the main floor office section at Standard Federal Savings & Loan Association of Chicago. The net result is a noticeable increase in employee morale and efficiency while still maintaining the spaciousness and artistic beauty of high bay, beamed-ceiling main banking area.

When Standard's management decided to relight, they brought their problem to Super Electric Construction Company, Chicago electrical contracting and engineering firm. Standard wanted a modern office lighting system for the area in question, but they did not want a multiplicity of rod or chain suspensions to detract from the decorated high-beamed ceiling over the main floor.

Super's solution to this problem was the design and installation of a wall-supported large-area lighting canopy. Armed with a plan view of the structural supports, a realistic cost estimate, and an isometric rendition of the proposed relighting to "sell" their idea, Super Electric soon had management's approval. The system, as installed, is shown in the accompanying photographs.

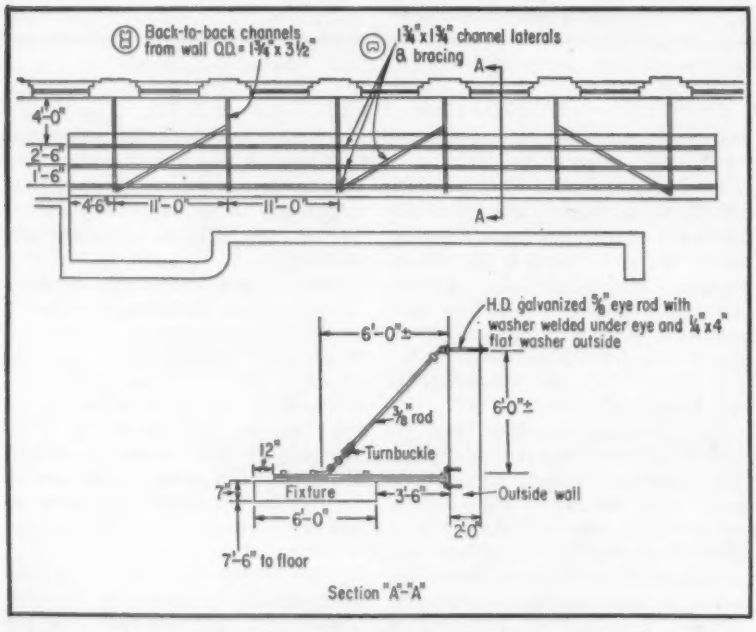
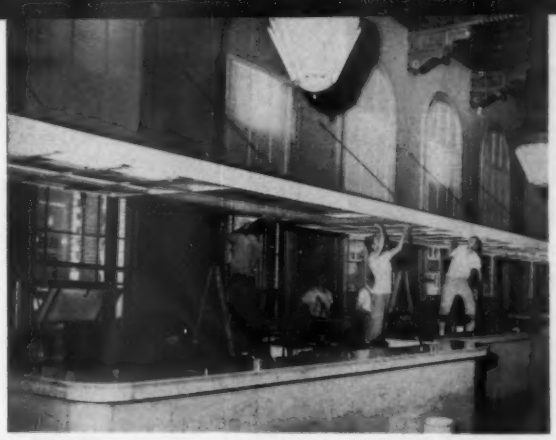


FIG. 1.—Details of structural framework and wall brackets to support 64-ft fluorescent canopy. Continuous channel framing was used.

Canopy of Modules

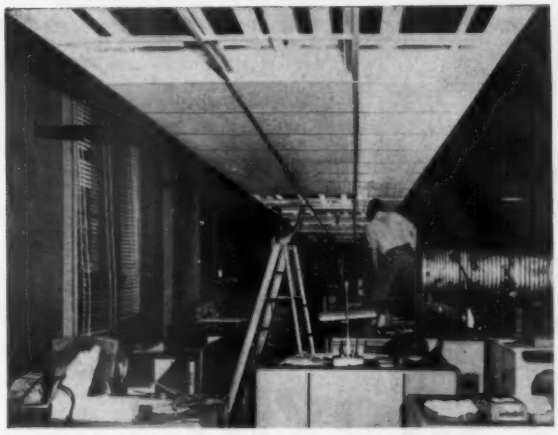
The long, illuminated canopy (6 ft by 64 ft) is a composite design of Super's engineers and Mason and Basedow Co., Chicago lighting fixture consultants and representatives. It is composed of eight 6-ft by 8-ft Panelaire units (Lighting Products, Inc.) mounted end-to-end to light the 14-ft by 68-ft office area. Each factory-assembled and -wired unit contains six F96T12 cool white fluorescent lamps on 12-in. spacing; has 12 T-bar-supported 2-ft-sq plastic louver diffusers with 45° shielding lengthwise and crosswise. The bottom of the "fixture" is 7 ft, 6 ins. above floor level and the inner edge is 3 ft 6 ins. from the wall.

Because of the 25- to 30-ft beamed ceiling above and to provide a substantial downward lighting component, all but two rows of lamps in the canopy are equipped with relatively narrow metal reflectors. To produce a soft upward component for the ceiling, the second and sixth rows from the wall are without reflectors. However, individual lamp reflectors can be easily added or removed to achieve a desired lighting effect. The system was originally designed for a minimum maintained intensity of 50 footcandles on the desk tops. Supplementary natural light during daytime operation will raise this level considerably.

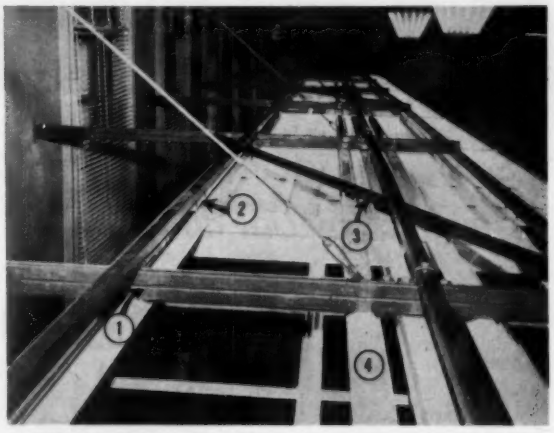


LIGHTING CANOPY viewed from main banking floor. Only visible means of support are wall anchor rods which were later painted to match wall color.

LOOKING DOWN on 64-ft "fixture" installed over office area. Note structural framework supporting canopy.



INSTALLING plastic louver diffusing panels in T-bar supports after lamps were added to canopy. Local lighting on desks was discarded after new system was turned on.

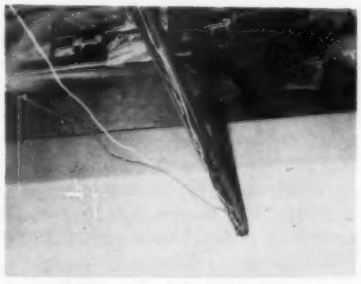


CLOSEUP OF structural framework on top of canopy showing (1) transverse brackets; (2) lateral channels suspending fixtures; (3) cross-bracing; and (4) lamp reflectors.

An apparent lack of visible (to the casual observer) support for the fluorescent panel was a prime sales feature of the canopy lighting system. Super's trim structural design met Standard's requirement that the "obviousness" of the lighting "fixture" be subdued and that no ceiling suspension be permitted.

The basic structural framework supporting the lighting canopy is fashioned from continuous channel framing members. Three lateral 1¾-in. by 1¾-in. channels, slot down, run the full length of the canopy with "fixture" sections bolt-suspended from each run. These laterals rest on six bracket "arms" spaced on 11-ft centers and extending out from the wall 8 ft, 1 in. above floor level. Each arm is an 8-ft 6-in. length of back-to-back continuous channel (1¾ ins. by 3½ ins.) with its free end supported by a ⅜-in. turnbuckle anchor-rod tied to an eye-bolt through the wall some 6 ft above (see Fig. 1). Anti-sway bracing between supports adds rigidity to the structure. Total weight of lighting canopy and support is about 2,600 lbs.

Because of the relatively small cross-section of the channels, compared to the 7-in. fixture depth, and their spacing with respect to the canopy, the structural framework is effectively hidden from view of main floor bank customers. By painting the channel and anchor rods to blend with the color of the walls, an illusion of a "floating canopy" is created.



CHANNEL extension from canopy goes through back wall to carry circuit wires

The 48 fluorescent lamps in the canopy are fed by six circuits, one for each 64-ft row of tubes. To simplify control, three double-pole toggle switches are installed in a room behind the main floor area. Each switch controls two circuits. Wiring from the canopy to the switches is carried in an extension of one of the supporting lateral channels equipped with a suitable closure strip.

Another innovation is the addition of two 150-watt, R-40 incandescent units at the back end of the canopy. One spot is focused on the clock at the rear of the main bank area; one flood illuminates the front of the safe deposit vault.

Standard Savings & Loan's management was so pleased with the canopy lighting technique that they are now considering a similar installation for the other side of the main banking area over the tellers' cages. At present, six pendent fluorescent cone fixtures light the bank traffic area.

SPECIAL DOLLY designed and constructed by contractors Haas and Haynie of San Francisco consisted of rugged steel chassis and wheels, with two threaded holes in the chassis bedplate to permit passage of 1-in.-diameter 6-ft long carbon steel rods. Rods were twisted by power rachet wrench; the process causing the rods to move up or down, as desired.

San Francisco contractors design and construct special dolly for . . .

High-Risk Cable-Moving Operation

Method for shifting cable laterally and dropping it to new cradle offers practical solution for maintaining vital service while rerouting is in progress.

SAN FRANCISCO contractors Haas and Haynie have just completed a high-risk cable-moving job that called for considerable ingenuity as well as a high order of care and detailed pre-planning. Indicative of the risk are the facts that (1) the "cable" comprised over 42,000 pairs of telephone wires, (2) the 115-ft length to be shifted had a weight of over 450 lbs/ft, i.e., a gross weight of 26 tons, (3) the section involved over a third of San Francisco's total telephone lines and included 50% of all cross-bay connections to Oakland, (4) this mass of wire had not been disturbed from its shelved position for over 33 years, and (5) any kinking, breakage or insulation damage during the shift could conceivably disrupt communications throughout the entire Bay area. Moving this cable sideways 6 ft and lowering it 27 ft to a new cradle position was necessary in order to permit construction of a basement and foundation for a new 7-floor addition to Pacific T&T's main San Francisco Exchange.

When first considering the movement of the cable, the question of constructing an entirely new duct and cable run was studied. However, due to the complexity of splicing involved, it was estimated that such an installation would require a year's time to complete and would cost in the neighborhood of $200,000. Therefore it seemed feasible to gamble on shifting the original cable and, completely justifying that decision, the successful shift was completed in three months at a cost below $80,000. In making this shift, the new cable site was first excavated, shored and side-braced by 3-in. diam. horizontal jacks positioned on 4-ft centers. Steel beams were then installed at desired elevations to support the new cable cradle. Next, the old cable was carefully "boxed' by 2- by 12-in. planks, with containing steel bands installed every 18 ins. to insure rigidity. This protective plank sheathing added 50 lbs/ft, resulting in a new gross weight (of the overall section) of 28 tons.

The next step was to install a series of 13 timber bridges at 10-ft intervals across the newly-excavated 22-ft-wide trench. Each

bridge consisted of two 16- by 16-in. beams, with side lips consisting of 2-by-4s being added to keep special dollies from rolling off the tracks, and with gaps of 6 ins. between timbers being provided to permit free lateral movement of dolly-borne vertical rods.

These special dollies, designed and constructed by the contractors, consisted of plate-steel chassis; eight steel rollers supporting each such assembly, and each chassis drilled and threaded to permit passage of two continuous-thread 1-in. diam. high-carbon steel rods. Through one of these holes on each dolly a 6-ft rod was initially inserted and equipped at its lower end with a clevis and ¾-in. steel cable sling. These slings were passed around the plank-boxed cable and the ticklish job of raising, horizontally shifting and lowering the cable to its new position began.

The first crucial step was to raise the cable from its 33-year resting place. This was accomplished by using a power ratchet wrench to progressively twist successive threaded rods a few turns each, thereby raising the cable a fraction of an inch at a time until it had completely cleared its former bed.

Lateral movement to a line directly above the new cradle was then accomplished by using pry bars and wedges beneath dolly wheels; this step requiring 4 hours to shift the cable the required 6 ft.

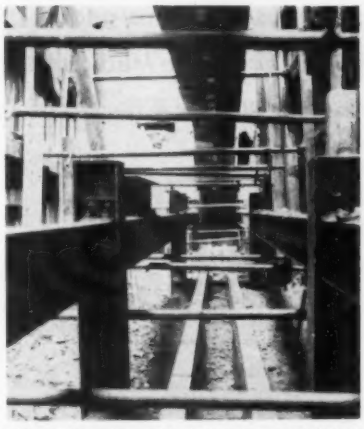
Lowering the cable was similar to the raising operation in reverse, for again the power wrench was used to progressively rotate and lower successive sling-supporting rods. As each rod reached its lower limits, however, a second rod was threaded into the adjacent hole in the dolly; a new sling was positioned beneath the boxed cable and by adjusting the strain on adjacent rods, the load was gradually transferred to this second series of slings. This process was repeated five times in the process of lowering the cable the required 27 ft.

As successive tiers of horizontal shoring-bracing jacks were encountered in this lowering process, the jacks were removed and reinstalled immediately above the descending cable.

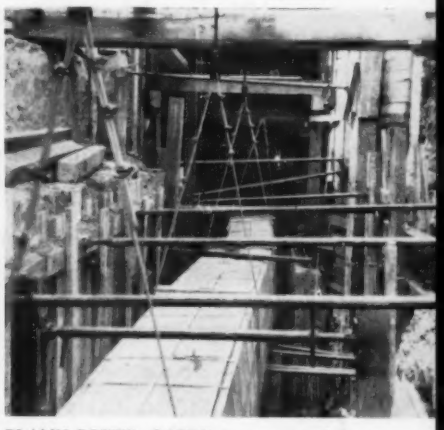
Since the route of the excavation extended 35 ft out under a busy city street and since the trenching (which went down 37 ft at the deepest point) also encountered an old brick storm sewer, the overall project included erection of a temporary traffic bridge and the installation of a protective concrete sheathing around the sewer.

This cable movement was "blueprinted" by telephone engineers, yet all of the details were left to the ingenuity of the contractors, who developed the actual method, designed the dollies and successfully master-minded the transfer.

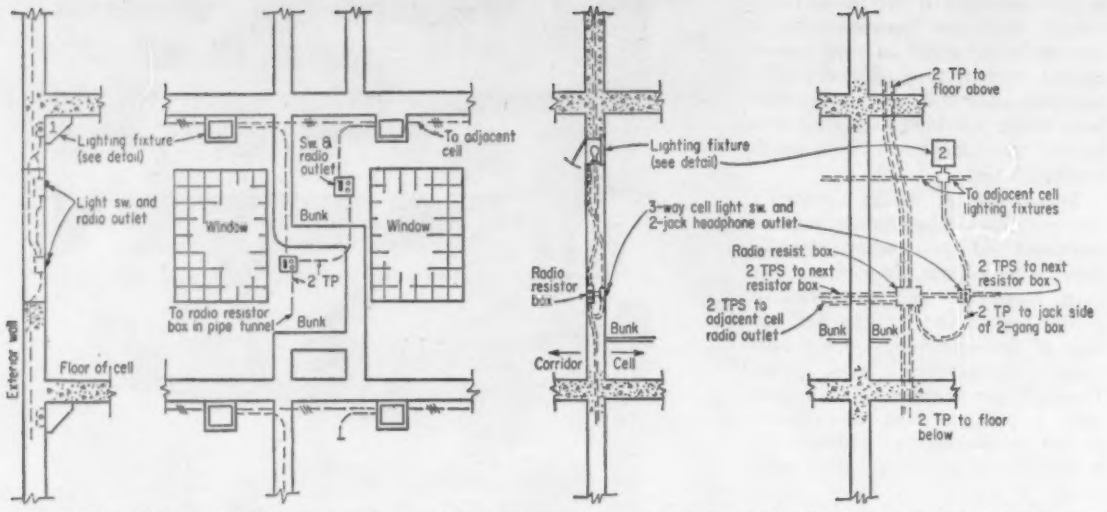
THIRTEEN TIMBER BRIDGES were constructed on 10-ft intervals to span the 115-ft long 22-ft wide trench. Slot between paired timbers permits passage of dolly-supported rods, while 2-by-4 outside lips atop beams prevents dollies from shifting laterally. Shelf at right is position where old cable lay prior to its movement.



BOTTOM OF EXCAVATED TRENCH shows position of new steel beam cradle for cable being lowered. Lateral jacks holding side shoring in place were progressively removed and reinstalled directly above boxed cable as the lowering process continued. Complete relocation of this vital cable bank required three months, while estimated time to install and splice entirely new cable would have approximated a full year.



PLANK-BOXED CABLE is supported by steel slings secured to lower ends of threaded rods by swivelling clevis attachments. Rods were progressively rotated and lowered until their lower limits of travel were approached, then second series of rods were inserted through dolly bedplates, longer slings were attached to the alternate rods, load was transferred to these new supporting mediums and the lowering process was repeated.



MEDIUM AND MAXIMUM SECURITY cellblocks differ in arrangement, construction, type of lighting units used, lighting control and details of radio wiring. Maintenance of electrical components in maximum-security wings is possible from narrow utility service corridors located between rows of cells.

Medical Prison Wiring

Discussed herein are numerous problems and solutions pertaining to electrical planning of California's modern Medical Facility at Vacaville. Wiring was essentially by contractors Wismer & Becker of Sacramento and Rosendin Electric of San Jose.

By Hugh P. Scott

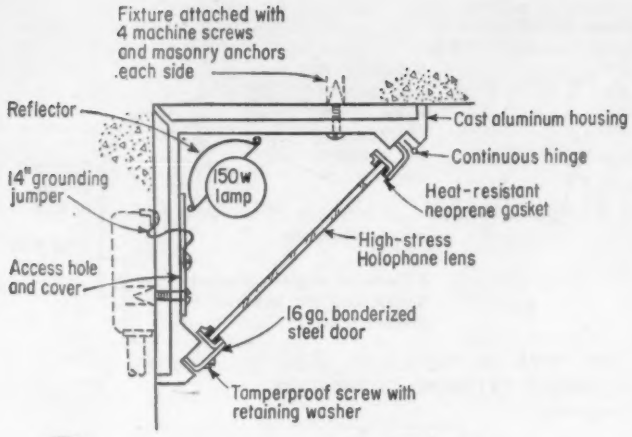
THE California Medical Facility at Vacaville, Solano County, is an institution having custodial and legal features of a prison with a staff and climate of a hospital. Planned and designed by the California State Division of Architecture for the State Department of Correction, it is, in fact, a single compact institution serving the dual function of Medical Facility and Reception-Guidance Center for the examination and classification of male offenders who are mentally ill, defective, abnormal, addicted to narcotics, or suffering from chronic diseases.

In designing the electrical system details, emphasis was placed upon 2-way protection; that is, protection of inmates against electrical injury, and protection of the electrical system against damage by inmates.

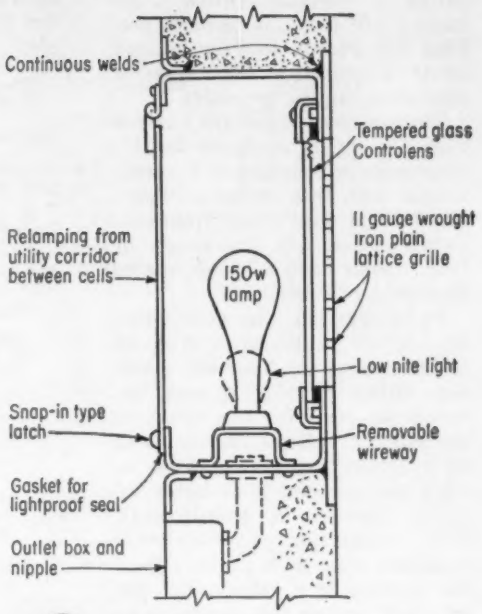
The authorities wish to protect inmates against the electrical system and also against *themselves*. The system, therefore, is both riot-resistant and tamper-proof. Lighting units are generally inaccessibly located, with protective screens or bars installed over shatterproof glassware. Switchgear is likewise inaccessible to inmates. Distribution conduits are buried in concrete slabs. And phones are of the "no dial" type to prevent calls from bypassing the main switchboard.

As indicated by accompanying illustrations, medium-security wings have cells positioned along outer walls, each cell having a separate exterior window and a door opening onto a gallery that surrounds the structure's central air core. Each cell also is equipped with a 2-gang combination light switch and radio outlet, related wiring being carried in conduits buried in outside walls, and vertical circuitry being confined to areas adjacent to tierred bunks.

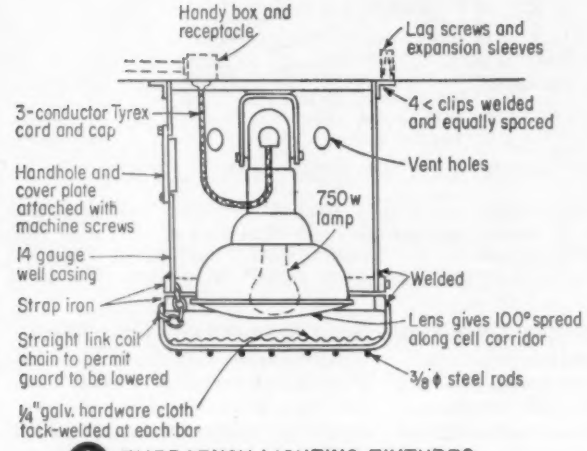
Lighting fixtures are cast-aluminum triangular-shaped units placed above windows at wall-ceiling intersections. Secured by machine screws and masonry anchors at both



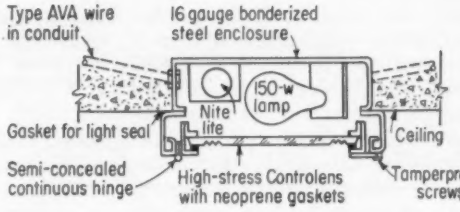
1 CROSS SECTION OF FIXTURE USED IN MEDIUM SECURITY CELLS



2 CROSS SECTION OF FIXTURE IN MAXIMUM SECURITY CELLS


Handy box and receptacle
Lag screws and expansion sleeves
3-conductor Tyrex cord and cap
4 < clips welded and equally spaced
Vent holes
Handhole and cover plate attached with machine screws
750w lamp
14 gauge well casing
Welded
Strap iron
Lens gives 100° spread along cell corridor
Straight link coil chain to permit guard to be lowered
⅜ ϕ steel rods
¼" galv. hardware cloth tack-welded at each bar

3 EMERGENCY LIGHTING FIXTURES OVER CELL AIR CORES



4 UNIT INSTALLED OVER CELL GALLERIES AND EXERCISE CORRIDORS

LIGHTING FIXTURES for maximum-security cel. . Jiffer in that they are flush- instead of surface-mounted, are serviced from the rear rather than from the front, are protected by wrought iron grilles as well as by tempered glass panels, and are secured by welded angles rather than by masonry anchors and machine screws.

top and rear, these units contain reflector-backed 150-watt incandescent lamps and are enclosed by high-stress Holophane lens plates held by neoprene-gasketed frames. Frames, equipped with continuous hinges and secured by tamperproof screws, may be swung open (into cells) for relamping or to permit front access to related wall-buried outlet boxes.

Switch-radio outlet boxes are (1) anchored into concrete walls by means of angle irons and lipped straps, (2) secured to same by welding and hidden machine screws, (3) equipped with interior metal barriers to segregate high- and low-voltage wiring, and (4) are variously flush-mounted or recessed. When recessed, the depth is sufficient to permit the installation of flush metal cover plates over jacks and switch toggles, thereby effectively curtailing inmate privileges when such action is deemed advisable. Cover plates, as well as stainless-steel switchplates, are secured with tamperproof screws.

For purposes of wiring the radio jacks, cells are paired; a separate conduit being run vertically from each pair of cells to a resistor box which is located in the pipe tunnel underlying that particular cellblock. Each conduit carries two twisted pairs of audio wires (each pair related to a separate channel program) and each wire is connected to a separate terminal and ½-watt 1800-ohm resistor. Resistor boxes (each one serving 12 cells) obtain program signals over shielded TPs extending from selector switches of radio junction boxes installed on first floor panelboards. Selector switches are heavy-duty 3-position units (Channel 1—Off—Channel 2) which, in turn, are connected to main (tunnel-installed) radio distribution feeders.

Where switch-radio outlet boxes are not covered by plates, lights normally may be switched on or off as desired by inmates. However, inasmuch as switches are 3-way units and since both hot legs of

each circuit can be twinned by activating an "override" switch at the main guard panel, it becomes possible for guards to keep all cell lights illuminated regardless of local switching by prisoners.

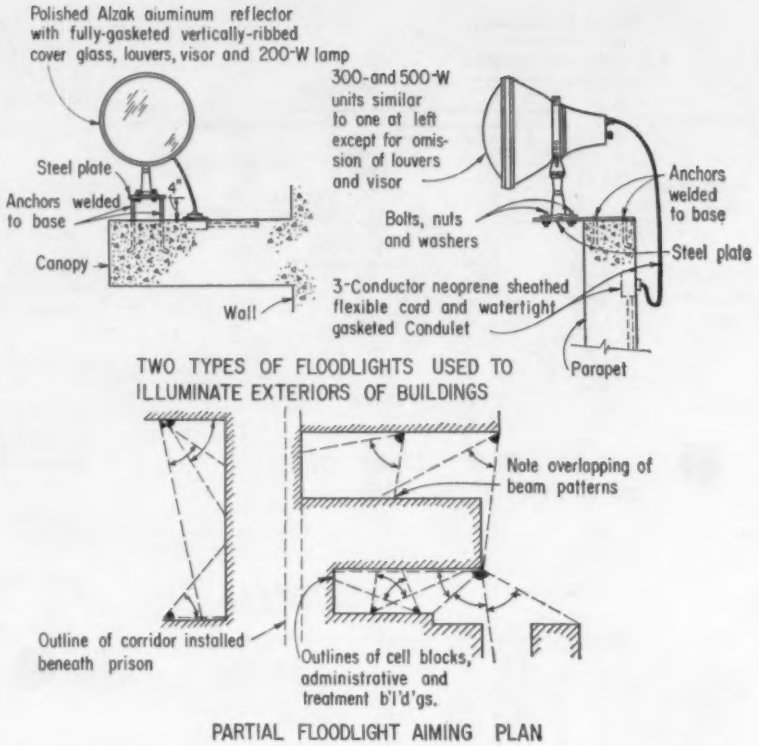
Three-way switches are likewise used for outlets equipped for the cover-plate option; although wiring is then such that individual lights may be controlled either from cells (when outlets are uncovered) or from master control panels located in related galleries.

By comparison, maximum-security cells are positioned in two rows at the core of the building, a narrow utility corridor running between the rows for the length of the cellblock. Cells, separately closed by gang-lock gates (and with related controls and pilot lights remotely located in guardrooms), have no exterior windows, being separated from them on one side of the building by a gallery and open air shaft, and on the other side by a wide exercise corridor.

In these cellblocks, wiring is carried in conduits installed in interior walls (between cells and central utility corridor) so it is possible for lighting fixtures to be relamped, radio resistor boxes to be maintained and wiring to be effected from the rear, rather than from the front or cell side.

Lighting fixtures in maximum-security cells also differ in design, being mounted flush in these interior walls, being protected by wrought-iron grilles as well as by tempered glass Controlens, and having grilles attached to housings (and housings secured to rear angle anchors) by means of continuous welds. Rear access doors of fixtures (opening into utility corridors) are gasketed to prevent light-leakage and are equipped with continuous hinges and snap-type latches. These cells are normally lighted by single 150-watt lamps and are controlled similarly to the methods described above, although, in strip cells, a 10-watt night-light is also installed in each fixture and control of both lamps is activated remotely by switches located in the corridors.

Radio outlet wiring also differs in maximum-security cellblocks, for resistor boxes are located in second-floor corridors rather than in underground tunnels; boxes are flush- rather than surface-mounted; and (instead of common conduits serving paired cells) separate cells are equipped with individual conduit


Polished Alzak aluminum reflector with fully-gasketed vertically-ribbed cover glass, louvers, visor and 200-W lamp
Steel plate
Anchors welded to base
Canopy
Wall
300- and 500-W units similar to one at left except for omission of louvers and visor
Anchors welded to base
Bolts, nuts and washers
Steel plate
3-Conductor neoprene sheathed flexible cord and watertight gasketed Conduiet
Parapet
TWO TYPES OF FLOODLIGHTS USED TO ILLUMINATE EXTERIORS OF BUILDINGS
Note overlapping of beam patterns
Outline of corridor installed beneath prison
Outlines of cell blocks, administrative and treatment b'l'd'gs.
PARTIAL FLOODLIGHT AIMING PLAN

FLOODLIGHTS are mounted on overhanging concrete canopies or steel baseplates so that light beams will not be interrupted by edges of parapets or roofs when they are aimed downwards or sideways to illuminate exterior surfaces of cellblocks. Overlapping beam patterns prevent existence of shadows or so-called blind spots.

runs containing TPs extending from separate isolating resistors.

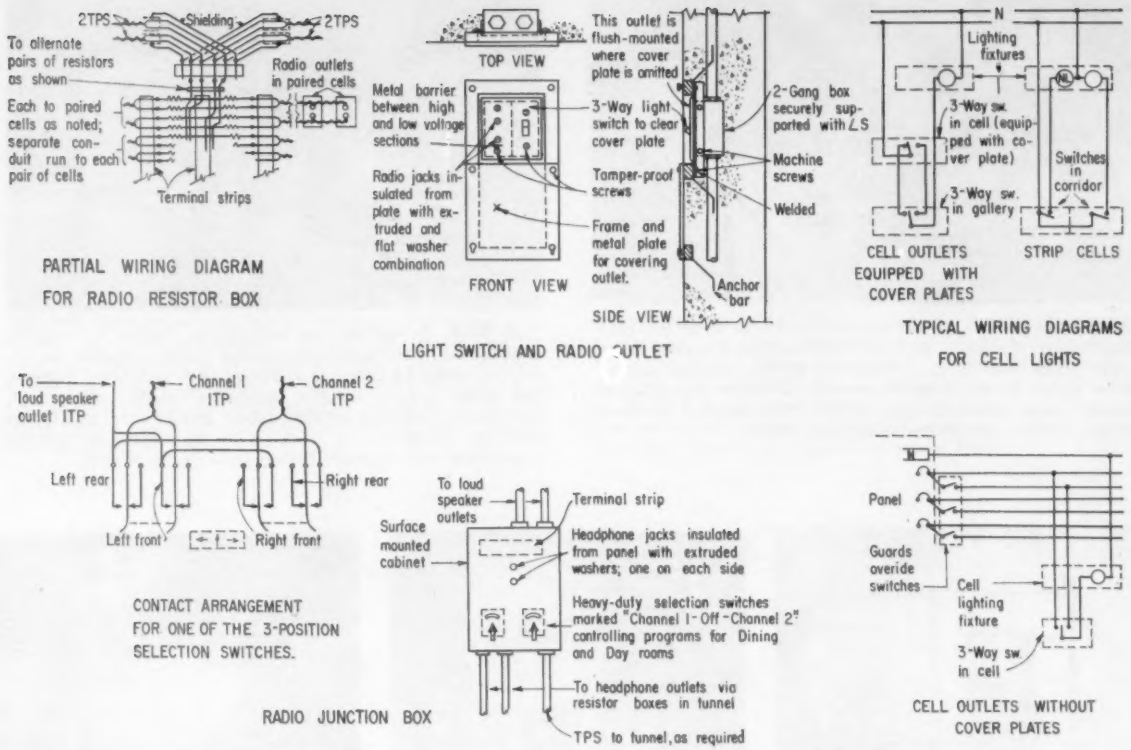
Lighting fixtures above galleries in both medium- and maximum-security wings are semi-recessed and are equipped with high-stress Controlenses in neoprene gaskets, semi-concealed continuous hinges and tamperproof screws, ceiling gaskets for light-tight mounting, and night lights as well as standard wattage lamps to permit 2-level illumination.

Riot-Proof Lighting

Emergency lighting fixtures installed above open cores and air shafts are also the same in both types of cellblock, consisting of 750-watt floodlights with lenses creating light-spreads of 100 degrees along building axes, and with 3-conductor flexible cords connecting units to ceiling-recessed receptacles and outlet boxes. These emergency fixtures are designed along riot-resistant principles, being enclosed by rugged steel (ventilated) well casings secured by lag screws and expansion sleeves to concrete overslabs, and being bottom-protected by steel-bar covers and galvanized hardware cloth, tack-welded at each rod crossing. Well casings and bottom covers are edge-reinforced by strap-iron bands welded to these components, while covers are secured to upper sections by straight-link coil chains to permit cover guards to be lowered for lamp replacement.

Except where windows are separated from cells or corridors by means of intervening interior air shafts, exterior walls of buildings are floodlighted by 200-, 300- and 500-watt luminaires. These floodlights generally are mounted on canopies or steel base plates that overhang the walls proper, thereby permitting light-beams to unobstructedly illuminate all vertical surfaces. Floodlights are also positioned and aimed so as to create overlapping beam patterns, thereby eliminating fringe shadows or intermittent "blind" spots. Depending upon location, installation details and intensities desired, floodlights are of three types.

Of these, the smaller (200-watt) type consists of a polished aluminum reflector with fully-gasketed


2TPS
Shielding
2TPS
To alternate pairs of resistors as shown
Radio outlets in paired cells
Each to paired cells as noted; separate conduit run to each pair of cells
Terminal strips
PARTIAL WIRING DIAGRAM FOR RADIO RESISTOR BOX
TOP VIEW
Metal barrier between high and low voltage sections
Radio jacks insulated from plate with extruded and flat washer combination
FRONT VIEW
This outlet is flush-mounted where cover plate is omitted
3-Way light switch to clear cover plate
Tamper-proof screws
Frame and metal plate for covering outlet.
2-Gang box securely supported with ∠S
Machine screws
Welded
Anchor bar
SIDE VIEW
LIGHT SWITCH AND RADIO OUTLET
N
Lighting fixtures
3-Way sw. in cell (equipped with cover plate)
3-Way sw. in gallery
Switches in corridor
CELL OUTLETS EQUIPPED WITH COVER PLATES
STRIP CELLS
TYPICAL WIRING DIAGRAMS FOR CELL LIGHTS
To loud speaker outlet ITP
Channel 1 ITP
Channel 2 ITP
Left rear
Right rear
Left front
Right front
CONTACT ARRANGEMENT FOR ONE OF THE 3-POSITION SELECTION SWITCHES.
To loud speaker outlets
Terminal strip
Surface mounted cabinet
Headphone jacks insulated from panel with extruded washers; one on each side
Heavy-duty selection switches marked "Channel 1-Off-Channel 2" controlling programs for Dining and Day rooms
To headphone outlets via resistor boxes in tunnel
TPS to tunnel, as required
RADIO JUNCTION BOX
Panel
Guards overide switches
Cell lighting fixture
3-Way sw. in cell
CELL OUTLETS WITHOUT COVER PLATES

LIGHT SWITCH AND RADIO outlet may be either flush-mounted or recessed to permit blanking-off by cover plates. Three-way light switches are connected to branch circuiting either through guard panels in galleries or through override switches on central main-floor control stations. Twin insulated radio jacks provide 2-channel headphone reception for inmates.

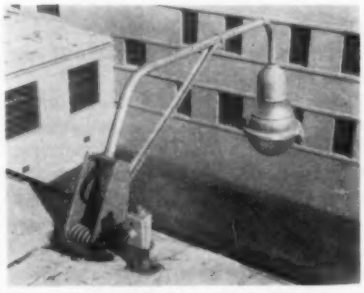
vertically ribbed cover glass, plus a visor and louvers to shield eyes of guards from direct glare. Aiming is facilitated by means of a swivel-tilting mounting bracket, while connection of fixture to interior protective circuitry is by means of a 3-conductor neoprene-sheathed flexible cord and watertight gasketed Condulet receptacle.

Larger versions of this same unit accept 300- and 500-watt lamps, although louvers and visors are omitted on these luminaires. In both cases, baseplates are secured to concrete parapets or canopies by means of welded J-anchors.

The third type of fixture used for lighting building exteriors is a special bracket unit that overhangs roof edges by 5½ ft. The luminaire (a 300-watt type 79R with toggle-latch globe holder) is equipped with multiple mogul sockets to insure illumination continuity, and it is supported by a 1½-in. conduit bracket and channel brace secured to a base fork. Since the fork is pivoted, the unit may be flipped backwards onto the roof for maintenance. And, since the pivotal machine bolt also serves as a center guide for a torsion spring (formed from coiled steel having a 150,000-psi working stress), the weight of the unit is effectively counteracted in this flip-over operation.

Extensive L-V Circuitry

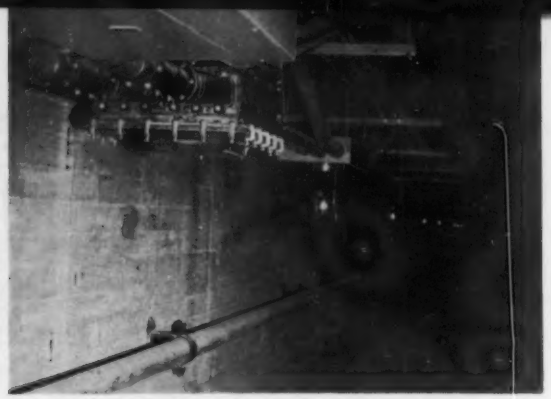
As would be expected in this type of installation, low-voltage wiring is extensive, involving not only prison-wide radio, telephone and intercom circuitry, but relay controls and audio-visual monitoring aids related to the remote operation of motorized doors, sliding grilles, interlocked gates, gang-locked cell doors, heating and ventilation equipment, corridor and protective lighting, sprinkler alarms, recall horns, emergency and floodlighting as well. When translated into terms of special wiring, control panels and cabinets, pushbuttons, switches and timing devices, these systems collectively involve a vast wealth of design and installation detailing.



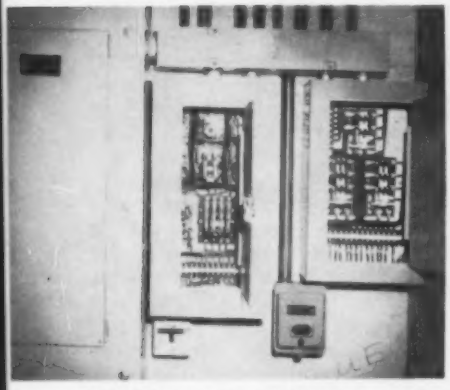
MULTIPLE-SOCKET LUMINAIRE equipped with toggle-latch globe holder is suspended from tubular arm that overhangs roof edge by 5½ ft. Pivoted base assembly and torsion spring facilitates flipping unit backwards for relamping and cleaning. Connection of fixture to interior conduit system is via flexible 3-conductor cord and watertight condulet.

To illustrate the extent of supervisory and security planning, control stations overlooking interior corridors, visiting areas and exterior double-door vestibules (located on the first floor of the administration building) are comprehensively equipped with necessary push- and push-pull buttons related to all sliding-grille electromechanical locks, door interlocks and limit switches in the immediate (direct view) area. In addition, guard stations (each manned by a lieutenant and sergeant) are

OVERRIDE PANEL at left permits guard to keep all cells illuminated regardless of local switching by inmates. Note relay panel related to protective lighting mounted above. Main panels in this assembly contain 60 single-pole 20-amp branch circuit-breakers. Also included (at right but not here shown) are fan controls and telephone cabinets.

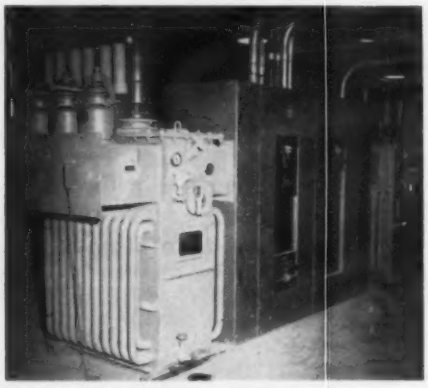


TAP BOX in high-voltage distribution system is ruggedly constructed with downward-opening covers secured by C-clamps; entrance adapters equipped with grounding jumpers and studs; internal bakelite separators between phases and split-conduit adapters between feeder conduits and box throat sections. Suspension of boxes is by threaded rods held by preset inserts in concrete ceiling slabs of the tunnel.



EMERGENCY AND SECURITY lighting relay cabinets in basements of cellblocks are bonded to one of two ground rods via No. 4 bare copper stranded cable. Second rod provides direct ground for dry-type 45-kva transformer related to this local substation facility, while cross-tie between the two rods completes this loop-segment of the overall grounding system.

SECONDARY SECTIONS of primary 4160/480-volt substation are key interlocked with main breakers to prevent closing of cross-tie unless one of the two related transformers is inactive. Main and tie breakers are located at tops of these switchgear assemblies, while controls for branch feeders are arranged beneath. Each station is multiply grounded through eight separate rods.



TYPICAL PRIMARY SUBSTATION is twin-transformer unit with incoming sections including banks of gang-operated oil-fuse cutouts that may be locked either in open or closed positions. Transformers are liquid-filled self-cooled 4160/480-volt delta-delta units, while secondary breakers have both thermal overcurrent and instantaneous magnetic protection for short-circuit protection.

equipped with light controls, override switches, indicating bullseye annunciators, phone, intercom, microphone and public-address facilities, the result being a full-control station which is self-contained and isolated, although closely integrated (through multiple electrical facilities) into the overall security system of the facility as a whole.

Main distribution of all services (high- and low-voltage power, inside and outside telephone wiring, control, radio and intercom circuitry) is carried through the 475-yd-long central underground tunnel, segments of the high-voltage distribution system being connected through 3-pole high-voltage tap boxes, and connections with all supply or branch feeders being effected in tunnel boxes such as the typical one illustrated.

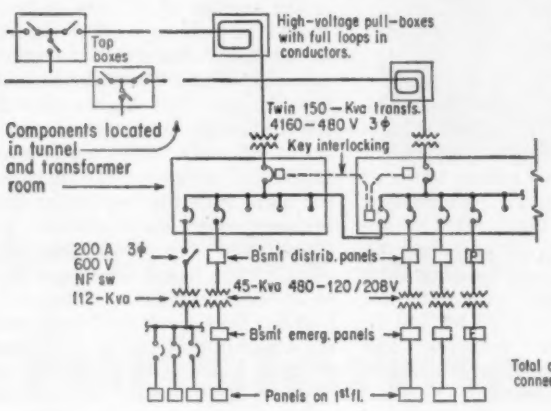
As noted, tap boxes have downward-opening dogged covers, bakelite separators inside boxes between phases, split-conduit adapters between boxes and feeder sections, and grounding conductor jumpers between tapered adapters. Boxes are suspended from overhead slabs by means of rod hangers secured through preset inserts.

Tunnel boxes vary in size from 12 by 12 by 6 ins. (for radio junctions) to 30 by 42 by 8 ins. (for inside telephone circuiting), high voltage boxes representing the mean of 24 by 24 by 10. As indicated, entering feeders in the direction of the tunnel axis are via loose-fit conduits bushed with ground couplings and bonded to boxes via copper flex. Boxes with dimensions of 24 ins. or larger are angle reinforced, while covers, in addition to having continuous butt hinges, are secured by screws on the other three sides. In those locations where high-voltage tunnel feeders branch off to connect with primary transformers, conductors are full-looped for flexibility.

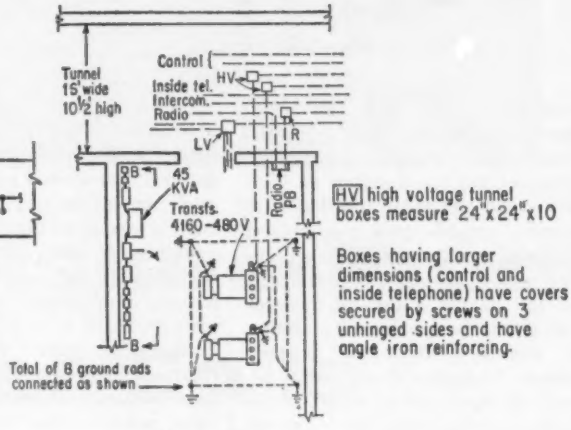
In those few instances where 5-kv non-leaded high-voltage cables were spliced (in tunnel boxes or manholes), junctions were effected by (1) first training cables in place and cutting ends square for flush butting, (2) pencil-tapering cable

TUNNEL BOXES are provided as required to facilitate connection of tunnel feeders with branch taps. Boxes vary in size with requirements of high- and low-voltage circuitry, inside and outside telephone wiring, control, intercom and radio. High-voltage box shown above measures 24-by-24-by-10 inches. Conduits entering boxes in direction of tunnel are equipped with expansion couplings.

PUSHBUTTON STARTERS for 480-volt ventilator fans in typical cell wing are connected to power panel via square common gutter. Related relays in surface-mounted panel at right are activated through 120-volt coils. Secondary 480-120/208-volt transformer at this local control point (not shown) is low-decibel unit, mounted on vibration isolators and connected to panels via copper flex.


Top boxes
High-voltage pull-boxes with full loops in conductors.
Components located in tunnel and transformer room
Twin 150-Kva transfs. 4160-480 V 3φ
Key interlocking
200 A 3φ 600 V NF sw
112-Kva
B'sm't distrib. panels
45-Kva 480-120/208V
B'sm't emerg. panels
Panels on 1st fl.

PARTIAL WIRING DIAGRAM FOR CELL WINGS



PLAN OF TUNNEL AND TRANSFORMER ROOM

TUNNEL DISTRIBUTION system includes feeders related to high- and low-voltage power, inside and outside telephone wiring, control, radio and intercom circuitry.

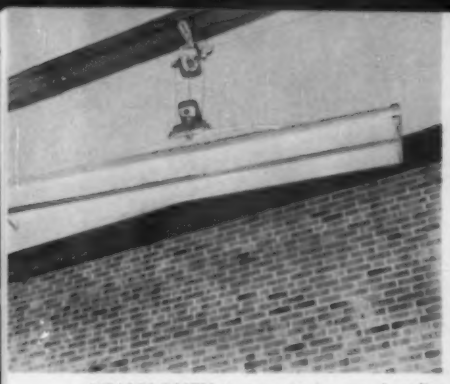
sheaths, insulation, tape and shielding to permit sweating-on of copper connection sleeves, (3) coating the assemblies with rubber cement, (4) building up insulation with electrical tape to 1¼ times original thickness, (5) half-lapping with friction tape, (6) applying a half-lapped layer of woven copper shielding braid, spot-soldering same to factory shielding tape with a medium-hot iron to prevent injury to insulation, then (7) grounding shielding pigtails by methods noted previously.

Power for a typical group of cell wings (as well as for buildings serving other functions) is provided by two classifications of basement-based transformation and control equipment, a main group substation stepping primary current from 4160 to 480 volts via twin 150-kva delta-delta self-cooled liquid-filled units, with individual (one serving each wing) 45-kva delta-wye dry-type transformers again dropping voltage to 120/208 for general lighting and power utilization.

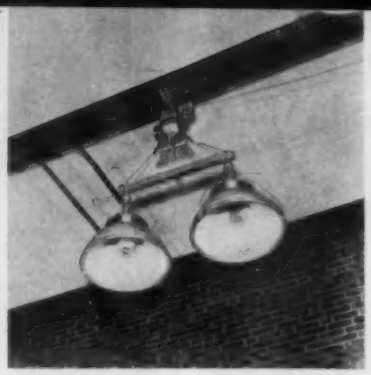
Related dry-type transformers are mounted on vibration isolators; are rated for noise levels below 56 decibels, and are connected with related components through metal flex in order to further reduce transmission of hum or vibration up through building steel or conduit systems.

In both substation set-ups, grounding is via multiple rods and bonding points; a total of eight ground rods being driven around each two 4160/480-volt units, and two rods flanking each single 45-kva transformer. Connections between rods, bare copper ground cables and transformers (as well as other electrical components) are effected via welded joints or approved clamps. In addition to the use of rods, general grounding incorporates cold water piping.

Credit for installing the electrical system belongs primarily to Wismer & Becker of Sacramento and Rosendin Electric of San Jose, although numerous other contracting organizations performed lesser portions of the work.



HEAVY DUTY disconnect hanger handles weight of 2-lamp 96-in. 15,000-lumen fluorescent lamp luminaire, contains 3-to-1 mechanical advantage pulley arrangement. Primary is broken by disconnect, ballast is left attached to luminaire.



DISCONNECT lowering hanger minimizes cleaning and lamp replacement labor cost, provides safety. Thompson Electric Co. device shown handles twin-reflector unit, allows ballast to be permanently attached to roof structure.

High Bay Lighting

By Ward Harrison, *Consulting Engineer, Cleveland, Ohio*

FOR many years, 750- and 1,000-watt incandescent lamps in suitable reflectors were standard equipment for the lighting of high bay areas. Although the 400-watt mercury lamp became available a quarter of a century ago, its advantages were not generally appreciated for nearly a decade. Thereafter, alternate spacing of mercury and incandescent units became popular. Lighting costs were reduced in comparison with incandescent, and the color was more acceptable than that of mercury alone. Also, this combination gave the necessary protection against power interruption, for the incandescent units came on instantly when power was restored, whereas 5 to 10 minutes elapsed before the mercury lamps relighted.

About the time of World War II, fluorescent lamps appeared on the market and in spite of the greater number of fixtures required, the 40- and 100-watt fluorescents gave approximately the same overall economy as the 400-watt mercury, and much better than that of incandescent lamps. Great numbers of them were installed in war production plants, even in high bay locations, often in continuous rows. One airplane plant, for example, used 40,000 fluorescent lamps at a height of 42 ft. Maintenance of such equipment was a major problem; and in this plant literally miles of cat-walks were installed for that purpose, at an expenditure of about $10 per running foot. As an alternate to cat-walks, some incandescent and mercury lighted plants were equipped with telescoping towers. For such a rolling tower of 40-ft maximum height, the present cost is about $13,000. This is approximately $160 per outlet for an installation of 80 twin-mercury fixtures (160 lamps), enough to provide 50 fc in a shop 75 by 640 ft.

Recently, both mercury and fluorescent lamps have undergone improvements which have rendered them better suited to the lighting of high bays. The original 400-watt A-1 mercury lamp was superseded by the E-1 with a 35% increase in efficiency. Then came the EW-1 with a color-modifying outer bulb, and next, for high bay use, the RW-1 in which the color-modifying phosphor coating was supplied on the upper part of the large outer bulb only, and most of the output of 22,000 lumens was redirected downward. This lamp, in a bowl reflector, is currently the most economical of mercury sources for use in high bays; that is, where lamps are mounted 20 ft or more above the floor. For a given expenditure, it supplies 40% to 50% more footcandles than the original A-1 lamp. The labor cost of cleaning units, and of lamp replacement, has been minimized and the work made safe by the general use of disconnect lowering hangers (see illustrations). One hanger has been found sufficient for twin mercury units operated from a two-lamp ballast.

A substantial advantage of mercury lighting, from the standpoint of plant engineering, is the fact that the ballast can be connected directly to the 277/480-volt circuits; this results in a substantially decreased wiring cost, in comparison with the 120/208-volt circuits required for incandescent units. The general trend, therefore, has been to use as many mercury and as few incandescent units as possible in a combined system.

Meanwhile, the parallel development in fluorescent lamps has been toward higher and higher output. A pair of the newly-improved 8-ft 215-watt Power Groove (very high output) lamps now produce 30,000 lumens, or three times as much light as the earlier 2-lamp 100-watt units, and this means a great reduction in the number of fixtures to be installed as well as a 40% increase in efficiency. However, the overall annual cost of a fluorescent system is still about 12% higher than for RW-1 mercury lamp units alone. In spite of this difference, many fluorescent systems are being chosen for high bay areas because of their excellent color, low brightness, and the softness of shadow and reflected glare. They, like the mercury, may be installed on 277/480-volt circuits.

It has been mentioned that one of the stumbling blocks of fluorescent systems has been the difficulty and expense of providing for adequate maintenance. With Power Groove (15,000 lumen) lamps, not nearly so many fixtures are required but the fixtures, including the ballast, are heavy for lowering, and, at the present time, it does not seem practical to separate the ballast from the rest of the fixture because of the many wiring connections. The matter of lowering has been very nicely solved, however, by the development of a heavy duty disconnect hanger which will readily handle the weight of any fluorescent unit (see illustrations above).

To summarize, incandescent units at higher mountings are pretty well superseded today by mercury and Power Groove (15,000 lumen) fluorescent lamps. Color-modified mercury lamps provide the lowest cost of lighting. Fluorescent lamps provide the softest and most agreeable light. A combination of the two, in about equal numbers, approaches the economy of mercury with good color, and the necessary provision against power interruption for mercury lamp systems.

A CASE STUDY

STEP 1—Carefully remove original insulation from welding transformer coils.

How To Moisture-Proof Transformer Coils

with silicone materials to keep tube-mill resistance-welding transformers operating in a constant moisture spray.

By William Howard, *Howard Electric Company, Detroit, Mich.*

PRODUCTION continuity is an important factor in maintaining scheduled output at American Metal Products Company, manufacturers of torque tubes and rear axle housings for trucks and passenger cars. Flat steel stock, from $\frac{3}{16}$ in. to $\frac{3}{8}$ in. thick, is formed in Yoder tube mills and then butt welded by resistance welding machines containing a rotary transformer.

Since three identical 600-kva resistance welding machines are in the plant's production lines, AMP engineers kept a spare rotary transformer to replace any unit which might break down. And failures did occur because of the moisture conditions created by direct-stream water cooling of the welding rolls and the necessary water cooling of transformer secondary windings to dissipate heat losses resulting from high current densities. Replacement of a faulty transformer was expensive. It took from 18 to 24 hours to remove the old unit and install the spare. Costs, including machine down-time, ran more than $2000 per failure.

The Problem

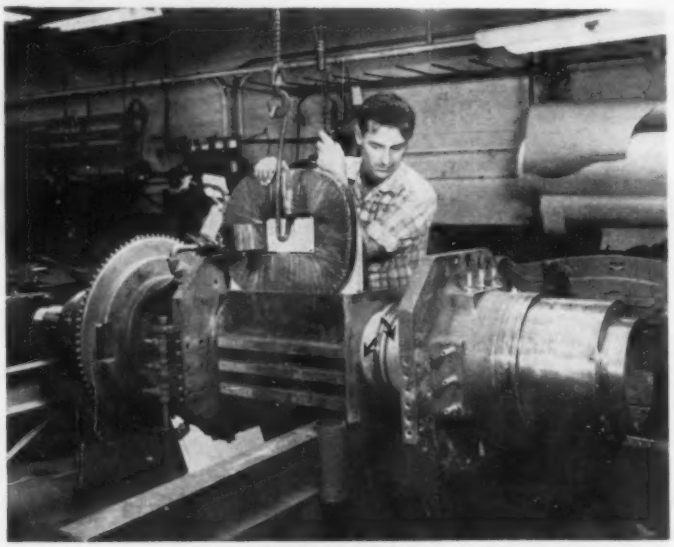
After the welding units were operating for a relatively short time, the transformer primary coils faulted to ground. Apparently, failure was caused by moisture penetrating the coil insulation from (1) the direct spray and water vapor from the welding rolls; (2) transformer cooling system leaks around internal seals and gaskets; and (3) seepage through porous sections of the cast copper transformer rotor.

Rewinding the coils with materials comparable to the original insulation proved unsatisfactory. Transformer life remained unpredictable. While average operating life was in excess of a year, units were known to fail earlier—one within an 8-day period. Some repair and insulating method had to be found to minimize failures and extend transformer life.

STEP 2—Apply Silastic 123 Paste to fill coil crevices, obtain a smooth surface and provide a bond for silicone rubber tape wrap.

STEP 3—Wrap coil and coil lead with 20-mil self-adhering Silastic tape; provide one-half lap of 1⅜-in. wide tape. Tape bonds to itself but does not stick to hands, tools or metal.

STEP 6—Bake dipped coils in a 300°F oven for eight hours to cure Silastic and varnish insulation components.



STEP 7—Reassemble coils in transformer using 1/32-in. and 1/16-in. G1801 Fiberglas Phenolite board for insulation to ground and between primary and secondary coils. Note silicone rubber mechanical seals (arrows).

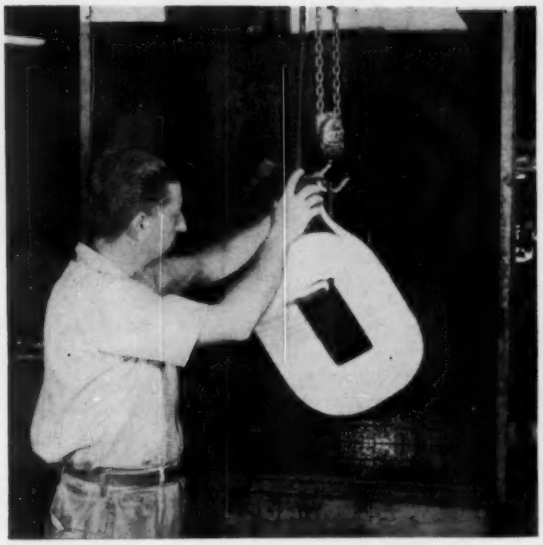
The Solution

Initial step in resolving this problem was an extensive series of tests to evaluate various insulation systems and insulating materials. One was an insulation resistance test on a number of differently insulated sample coils immersed in tap water. One coil was insulated with a new self-adhering silicone rubber tape (Dow Corning Silastic) reinforced with a silicone varnish impregnated glass tape outer wrap. For three weeks, insulation resistance of all immersed coils was measured daily with a 500-volt Megger. Coils passing these tests were then subjected to a 2000-volt "hi-pot" test. All but the silicone-rubber insulated coil failed under high potential.

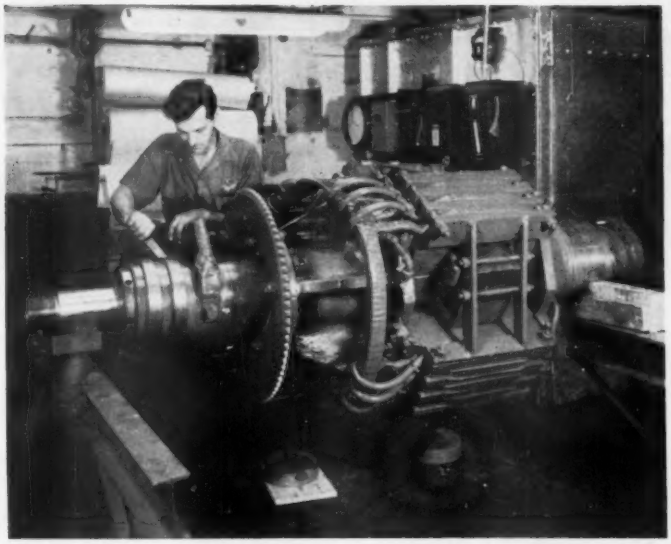
Several more weeks of testing on this specific coil ended with choice of this insulating method as the answer to the problem. When tests were discontinued, insulation resistance still measured infinity.

Howard Electric Company engineers then developed a step-by-step procedure for insulating all the primary transformer coils with these test-proven materials. The accompanying sequence photos il-

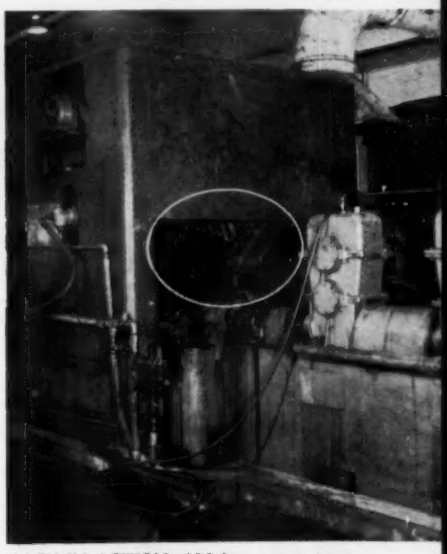
STEP 4—Apply an outer wrap of 1½-in. glass tape over the unsupported silicone rubber tape. Then bake one hour at 300°F to pre-cure the Silastic.



STEP 5—Dip pre-baked coils in silicone reinforced varnish to thoroughly impregnate the glass cloth outer wrap.



STEP 8—Paint entire rotating unit with a coat of Glyptol as final step after complete assembly including welded connections. Electrical joints and connections are insulated with Silastic and glass tapes same as coils. Water connections to secondary coil cooling jackets are made with Neoprene hose.



BACK-IN ACTION, 600-kva rotary transformer (circled) in resistance welding machine defies extreme moisture conditions with its new silicone-rubber insulated, moisture-proof coils.

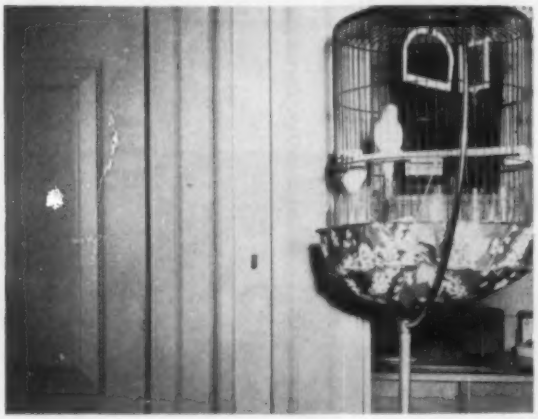
lustrate this method from start to finish.

Before assembling the transformer with its re-insulated coils, porous sections of the cooling water chamber within the cast copper transformer body were sealed. To do this, the water jacket was filled with silicone modified varnish under pressure to force varnish into all open pores. As an added precaution, all mechanical seals and gaskets were replaced with Silastic ones.

Results

Experience with the Silicone-rubber re-insulated rotary welder transformers has been exceptionally gratifying. The initial unit has been operating under the rugged production conditions for more than eight months without any apparent drop in coil insulation resistance. And there is every reason to assume the transformer will continue to operate indefinitely. So far, American Metal Products Company has had two of their four 600-kva transformers reinsulated by this technique, and the other two are scheduled for the same treatment.

ELECTRIC SERVICE to all buildings must be underground, since power lines were not part of the 18th-century scene. Meters are not to be visible on the outside of the house; they are recessed into the exterior wall in alcoves with hinged covers, finished to match the exterior siding.



WIRING DEVICES in interiors are painted to blend in with surroundings. Light switch (to left of bird cage) is practically unnoticeable except for toggle handle; convenience receptacle beneath furniture piece is set into baseboard close to floor and painted.

Colonial Williamsburg:

Modernization in Reverse

Comfort and convenience of today's electrical living are enjoyed along with yesterday's furnishings and architecture.

ELECTRICITY is one modern convenience which Colonial Williamsburg, the restored section of the historic Virginia city, has not been denied.

The project of restoring this 18th-century capital of Virginia, begun in 1926 and financed by John D. Rockefeller, Jr., has involved the reconstruction of more than 400 buildings, restoration of more than 80, and the removal from the area of more than 700 modern buildings —all at a cost of more than $61,-500,000.

More than a half-million people visit the area each year and go through those buildings which are open to the public. Many others are private homes, all equipped with electrical appliances, some

BIRDHOUSES hanging from tree branch contain spotlights for night-time illumination of restaurant sign. Underground feed emerges at base of tree and is fastened to tree trunk, painted to match the bark.

warmed by heat pumps—but all are restored in the colonial vein.

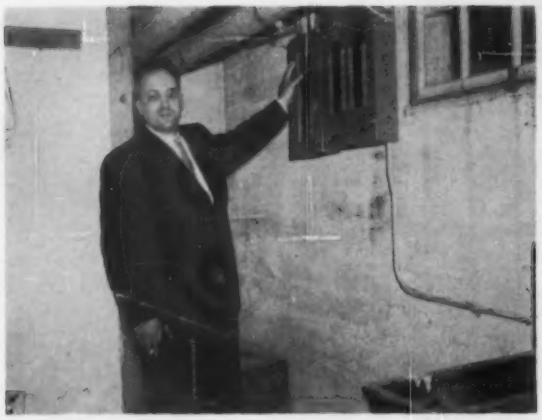
To provide the usefulness and safety of modern electric power and yet retain the appearance and flavor of the original structures, Chewning and Wilmer, Inc., of Richmond, Va., electrical contractors currently engaged to wire newly restored areas, are charged with the problem of making electrical equipment and wiring as inconspicuous as possible.

The accompanying photos illustrate some of the unique devices which have been and are being used to accomplish this objective.

HANGING FIXTURES in interiors are fed by means of wired hooks. Fixture wire passes through hollow hook, through small hole and into lantern-type fixture.

WINDMILL, a strict reproduction of a 1700 original, turns in its entirety around a central shaft, following the wind. Concealed collecting ring was installed on wind shaft to provide electrical continuity to ground for lightning rods on each tip; another 26-in. diameter ring was required on main shaft to bring 110 volts to interior of mill to operate electric heater for attendant.

EXTERIOR FIXTURES simulate old lanterns; cords are concealed in pipe and chain supports. Street lights are maintained by power company.



FOREMAN Robert A. Martle of the Reinicke Electric Company is pictured beside 200-amp multi-breaker service entrance panel his company installed as part of rewiring job that transformed a 43-year old residence into a model of up-to-date efficiency.

ALL-ELECTRIC KITCHEN, as modern as tomorrow, features the latest innovations in electric cooking and laundry equipment.

Medallion Rewiring

. . . A case study of the first rewired residence in the Midwest to be awarded a Bronze Medallion.

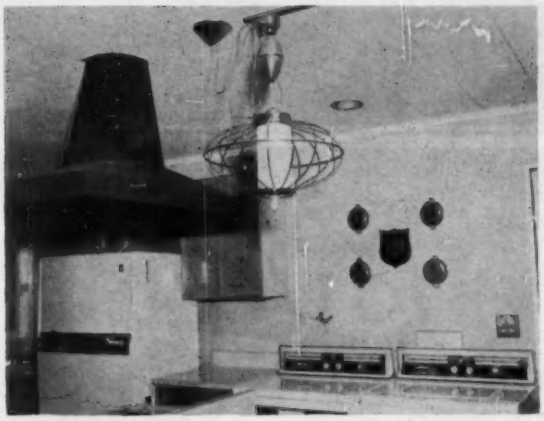
RESIDENTIAL rewiring offers tremendous opportunities for the aggressive electrical contractor. This is a field where he can create business with good margins of profit while at the same time contribute to the overall betterment of his community. Here, for example, is an account of a rewiring job installed by an electrical contractor in northern Illinois who specializes in this field. His plan for promoting residential rewiring is based on the premise that this type of work is best sold by example and not price. The theory proved itself recently when one of the rewiring jobs accomplished by the Reinicke Electric Company of Crystal Lake attracted nationwide attention as the first rewired residence in the Midwest to receive the electrical industry's top tribute. The outstanding rewiring and relighting job won the Bronze Medallion—a symbol of electrical excellence and superior wiring.

SERVICE ENTRANCE in the form of a run of 2-in. conduit containing three-#3/ O RH cables provides power-plus for the new wiring system. The 2-in. conduit feeds two multi-breaker panels that control a total of 26 single pole, 110-volt general purpose circuits, plus four double pole, 240-volt appliance circuits.

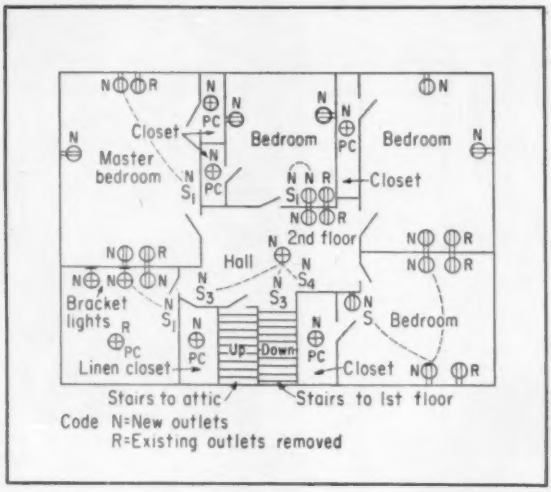
The modernized, high-capacity wiring job which provides for the installation of the latest innovations in electrical household equipment has transformed the 43-year old residence into a model of up-to-date efficiency.

The first step taken towards the home's complete electrical modernization began at the primary point from which all electrical circuits originate—namely the service entrance. In order to install entrance equipment capable of supplying uninterrupted efficient service for any probable combination of loads, Reinicke Electric thoroughly inspected the home's existing wiring system. Then they analyzed and estimated all probable future loads, keeping in mind the new outlets, circuits and appliance requirements their modernization plans called for. The demand of these realistic and probable load totals dictated installation of a 200-amp, 3-wire 120/240-volt service entrance.

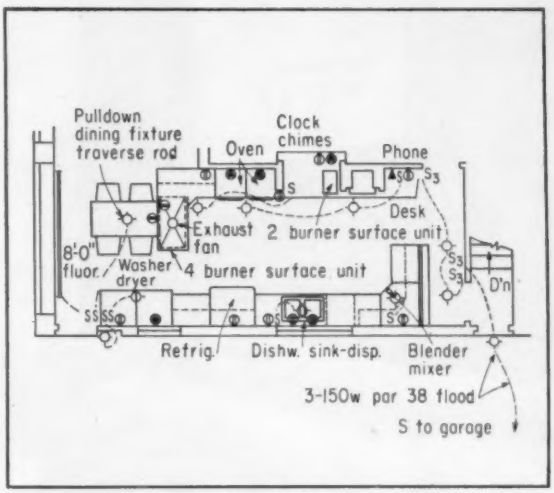
The service equipment consists of three lengths of No. 3/0 RH cable installed in a new surface run of 2-in. conduit that is attached to the outside rear of the home, an outside weatherproof meter socket, a 2-in. weatherhead and a 2-in. service entrance elbow, plus two multi-breaker type panels installed in the basement utility room. Both panels have 100-amp built-in main breakers that will control a total of 26 single pole, 110-volt circuits, plus four double pole, 240-volt circuits. The 110-volt branch circuits will feed both the new and existing outlets installed throughout the house, while the 240-volt circuits will channel power to the new kitchen and laundry appliance outlets.



LIGHTING in the kitchen and dinette as well as the rest of the house meets the electrical industry's "Light For Living" recommendations. Left photo is a partial view of the kitchen lighting that consists of seven recessed fixtures strategically placed to provide excellent overall illumination with plus-brightness of specific work areas. Right photo shows a pull-down fixture mounted over dinette table in kitchen dining area. A matching semi-ceiling fixture is also installed in the family room adjacent to the kitchen.



WORKING DRAWING of the 43-year old home's second floor wiring system. **N** denotes new outlets called for in the modernization job; **R** signifies existing outlets that were removed.



KITCHEN WIRING PLAN developed by Reinicke Electric in cooperation with the Public Service Division of Commonwealth Edison Company details appliance outlets, lighting and multiple switching arrangements.

The next step of the rewiring job was to add the new outlets and circuits called for in Reinicke's preplanned drawing developed in cooperation with the Public Service division of the Commonwealth Edison Company. (Plan drawing at left above is a schematic drawing of the second floor's wiring system. Note that new outlets are designated by the letter *N* and existing outlets removed are designated by the letter *R*). Carried on simultaneously with this new work was the revamping of existing circuits. The old service entrance fuse cabinet located in the basement front of the house was remodeled to serve as a junction box and its circuits re-fed by a run of 1-in. steeltube from the new multi-breaker panels.

Single points of switching used to control light sources in stairways, hallways and pass-through areas were extensively remodeled. Multiple sets of 3-way and 4-way silent type, ivory switches were installed in these entrance areas enabling their light sources to be controlled from two or more locations, and making it possible to light the way in or out of the house. This is more than a convenience; it is a necessary safety measure in a hall or garage, on a stairway—wherever one-location control could mean dangerous stumbling in the dark. To add a further touch of thoroughness to the job, all existing conventional light switches stationed about the house were replaced with new silent type, ivory devices.

Since lighting is an important factor in any modernization plan, a variety of lighting techniques and ideas were employed to bring this home's lighting up to the standards needed to meet the electrical industry's "Light for Living" recommendations. The kitchen is lighted by seven recessed ceiling fixtures strategically placed to provide good general lighting with plus-brightness at specific work areas. An 8-ft fluorescent fixture is concealed behind a valance in the breakfast

(Continued on Page 207)

TAP·EEZ..
For Buildings
For Institutions
For Stores

FASHION PLATE, exciting new way to turn lights on . . . off. The only true decorator switch that's rugged enough for commercial and industrial use.

NEW TAP-ACTION FLUSH SWITCH FROM BRYANT

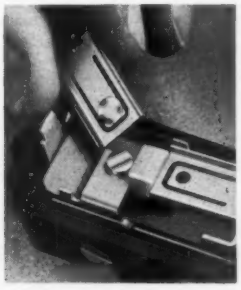
. . . FOR HOSPITALS, DEPARTMENT STORES, MOTELS, OFFICES, FACTORIES, HOTELS, RETAIL SHOPS, APARTMENT HOUSES . . . FOR EVERY COMMERCIAL OR INSTITUTIONAL JOB YOU WIRE

Tap-eez is the exciting new companion switch to Fashion Plate.* Its appearance is modern . . . the new, slim, tap-action bar blends well with design. More important, the attractive flush mounting makes it easy to clean . . . perfect for commercial applications where the emphasis is on economic maintenance. Tap-eez has positive action, low maintenance and whisper quiet operation . . . no teasing . . . no arcing. Its service is more reliable than ordinary toggle switches . . . really built to *last!*

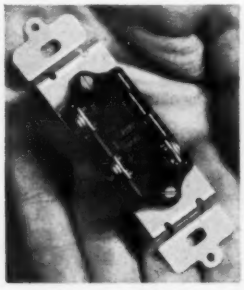
ASK YOUR BRYANT SALESMAN for a sample of Tap-eez. Take it apart and see the built-in quality . . . the trade-mark of Bryant superior wiring devices.

Smooth quiet action. Bar moves only 3/32" to operate mechanism.

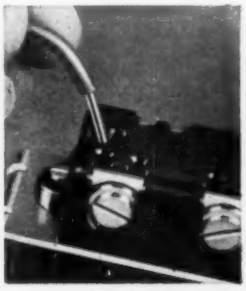
UNLIMITED APPLICATION—AVAILABLE IN SINGLE, DOUBLE AND TRIPLE GANG PLATES—IN BROWN, IVORY AND STAINLESS STEEL COMBINATIONS



Long-life silver alloy contacts. Positive controlled contact action. Rugged construction for heavy use.



Fits standard switch boxes, requires no special wiring. Compact design.



Easy, fast installation. Time-saving, clamp-type back wiring.

TAP·EEZ

The exciting things come from

BRYANT

THE BRYANT ELECTRIC COMPANY
BRIDGEPORT 2, CONNECTICUT

*Trade-Mark

J-99017-R

Dallas' NEW SOUTHLAND CENTER

supplied with 12,000 kva of electricity

Served by six Wagner Underground Network Transformers

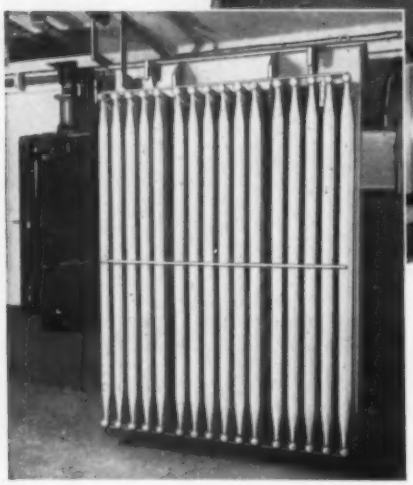
Dallas' fabulous new Southland Center consists of the 42-story Southland Life Tower, tallest building west of the Mississippi, and the 600-room Sheraton-Dallas Hotel. A "City within a City," the Southland Center is an enormous consumer of electric power. For example, there is a 6,450 ton electrically-driven air conditioning system—fourth largest in the world!

Dallas Power and Light Company, who supplies this power, has installed six 2,000 kva underground network transformers in the basement of the building to assure continuous electrical service to the Center. The transformers were supplied by Wagner.

Wagner Network Transformers are built for installations of this type. They have a low noise level . . . they are small in size to fit in close quarters, and now have a compact switch and panel radiators for smoother contour and easier maintenance.

Wagner makes a complete range of transformers for industrial and power company needs. Consult your nearby Wagner Sales Engineer about your power distribution program. There are Wagner branches in 32 principal cities.

Southland Center has 296 miles of electrical wiring . . . 15,800 lighting fixtures . . . 28 elevators . . . 8 escalators and an all-electric company cafeteria.



WT59-11

SERVING 2 GREAT GROWTH INDUSTRIES . . .
ELECTRICAL . . . AUTOMOTIVE

Wagner Electric Corporation

6413 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Simple Records Preserve Wide Range of Motor Data

Steve Tompko, manager of Electric Motor Repair Service in Chester, Pa., maintains that "paper work" should be minimized, yet should also be sufficiently detailed to (1) provide a source of reference in the event that a motor is returned for subsequent service or adjustment, and (2) establish a basis for accurately determining costs of labor, materials and overhead.

Therefore, when a motor is received, all nameplate data (together with customer's name, address, date of receipt, etc.) is recorded on a duplicate set of shop order sheets; one sheet remaining in the office and the other sheet accompanying the motor when it is assigned to a serviceman for repair. This same data is recorded in a permanent record book, so that subsequent reference can be traced by (1) date, (2) order number or (3) customer's name.

Also accompanying the motor through the shop is a 3-section perforated tag and an operations-and-material card that provides a full description of the work performed, mechanics working on it, their hours of regular or overtime, materials used and similar pertinent information.

Much of this same information is recorded on the tag, together with the price and pickup or delivery instructions. Of the three perforated sections: the first is given to the customer as a claim check when he brings in the motor for service, the second section goes to the office when the job is completed (together with the shop order and operations-and-material card), and the third section remains wired to the motor for identification upon pickup.

MANAGER Steve Tompko checks nameplate data of motor brought to receiving counter by customer. In addition to repairing motors, Electric Motor Repair Service also carries line of new motors in popular sizes, a supply of spare repaired units for exchange or for temporary replacement while repair work is being carried on.

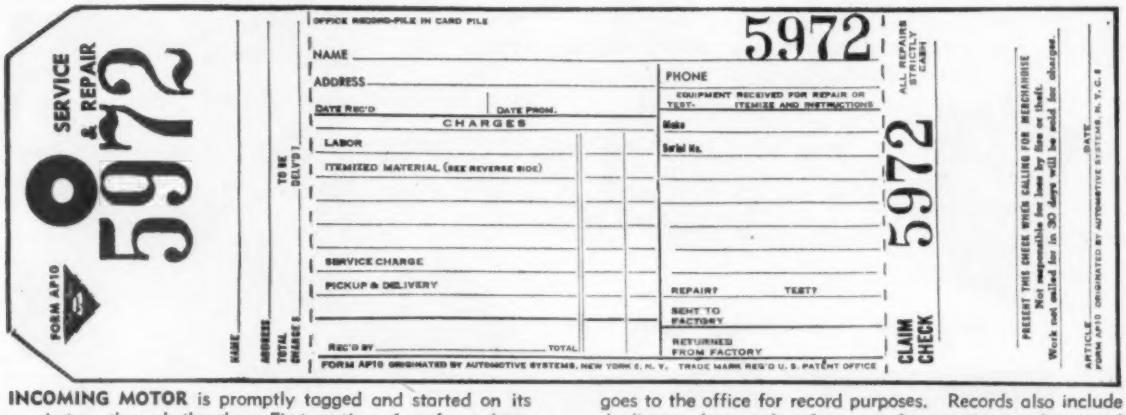
Servicemen also fill out personal time cards, indicating hours and materials allocated to specific jobs.

All materials leaving the parts-and-supplies section are immediately noted on perpetual inventory cards, requisitioned amounts being progressively subtracted from stock totals to show true residual quantities. When pre-established minimum levels are reached, the stock clerk initiates replacement orders. Inventory checks are also facilitated by the orderly arrangement of parts bins, shelves, reels and boxes.

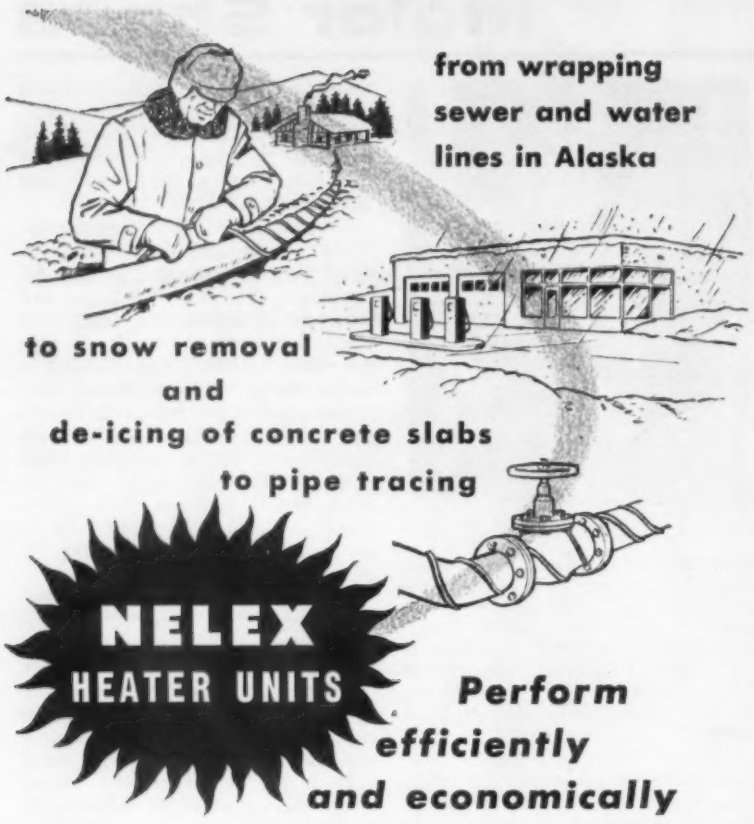
In training new employees, Tompko progressively moves them from dismantle to the assembly department, then to coil winding and on up to armature winding, stator insulation work and so on. In this progression the new employee works under the supervision of a more-experienced man and, in the process, he becomes familiar with dipping and baking practices, lathe work, drill presses and other related repair routines. Pay increments correspond to proficiency, so an incentive for quality workmanship is constantly present.

In layout, the shop reflects practical work-area progression, departments being arranged in a circular pattern around the first floor of the shop, with an overhead hoist shifting heavy motors from one department to the next as work progresses. Work on shafts and bearings is performed on the second floor, while a separate department handles fractionals and single-phase motors up to about 10 hp in capacity.

In addition to repairing motors, Electric Motor Repair maintains a supply of spares for rental, exchange or as temporary replacements during repair time. The company also carries a stock of new motors of the more-popular sizes. All of these various services are promoted periodically by mailing pads, blotters, calendars and sales letters to customers and prospects.



INCOMING MOTOR is promptly tagged and started on its repair tour through the shop. First section of perforated tag is given to customer as a claim check; another section remains wired to the motor for constant identification and a third section, containing repair, cost and pick-up data, goes to the office for record purposes. Records also include duplicate shop order forms and operations-and-material cards that list details of work performed, time and materials used, names of mechanics performing the work and other pertinent data.



from wrapping sewer and water lines in Alaska

to snow removal and de-icing of concrete slabs to pipe tracing

NELEX HEATER UNITS *Perform efficiently and economically*

Nelex Heater Units are literally the heaters of a thousand uses. Since Nelson introduced Nelex Heater Units in 1954, the only limit to their use has been the user's imagination. They have been used to solve countless industrial heating problems. If electricity is available and heat is required, these versatile units can be used.

Most Nelex Heaters are used at present in these two broad categories:

1. Installed on piping to maintain the temperature of process fluids and to prevent liquids in the pipes from freezing.
2. Installed in concrete structures or slabs for the purpose of de-icing and/or snow removal.

Write for Bulletin 1603. This brochure gives you complete information and performance characteristics of Nelex Heater Units.

At Nelson . . . . *quality* comes first!

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

Swing Booms Cut Motor Handling Time

Getting heavy motors and electrical equipment in and out of the shop has become a progressively simple chore at Wayne Electric Company, motor service shop in Ft. Wayne, Ind. Some years ago, Wayne Electric was one of the first shops in the midwest area to install a 4-ton hydraulic lift platform just inside the truck loading door. The lift was raised to the level of the floor overhang of trucks backed up to the door and the motors were pushed onto or off the platform. This method works especially well with panel trucks which cannot be serviced by overhead hoists.

Later, a sturdy swing-boom with electric hoist was installed to simplify and speed up loading and un-

SWING BOOM in shop loading dock extends well beyond building wall for truck service, swings in shop area and to left over lathe for large rotor work. Shop also has hydraulic lift platform flush in floor to right of boom pedestal.

TRUCK CRANE for field pick up and delivery is a simple, 360-degree swivel, hydraulic unit requiring minimum of space and manual effort. One man can handle almost anything within crane capacity.

Bull Dog®
Tape

Sticks tight quick . . .
Stays tight longer!

BULL DOG sticks tight with split-second speed, yet protects circuits for years. It has the high dielectric strength you want. Resists aging, temperature extremes, moisture, dryness . . . other severe environmental conditions.

Get the tape that's proved itself on more jobs — longer than any other tape on the market. Get BULL DOG.

MAKE BULL DOG YOUR PET TAPE... ***for every purpose***

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- **RUBBER**
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DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
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Also manufacturers of Garden Hose Matting · Stair Treads · Automotive Hose

COUNT ON SHURE-SET

the "power-concentration" tool that revolutionizes light fastening!

With Shure-Set's unique "Power Transfer" design, you can drive pins and threaded studs right through light-gauge metal into concrete with a few strokes of a hammer. The hammer-driven Shure-Set light fastening system is ideal for carpenters, plumbers, electricians, builders, and maintenance personnel for quick, reliable fastening into steel, concrete, or building block... no drilling or cartridge required.

Shure-Set supports the fastener until it is driven home . . . no duds, no bent studs or pins, no smashed thumbs. Try Shure-Set and you'll save time, money, and temper while doing a better job. Look for your Shure-Set dealer under "tools" in the yellow pages.

In addition to hammer-in Shure-Set, the versatile Ramset Fastening System includes Ramset powder-actuated method for heavier fastening, and Ringblaster® heavy-duty kiln gun.

OLIN MATHIESON CHEMICAL CORPORATION — Shure-Set®

Ramset Fastening System

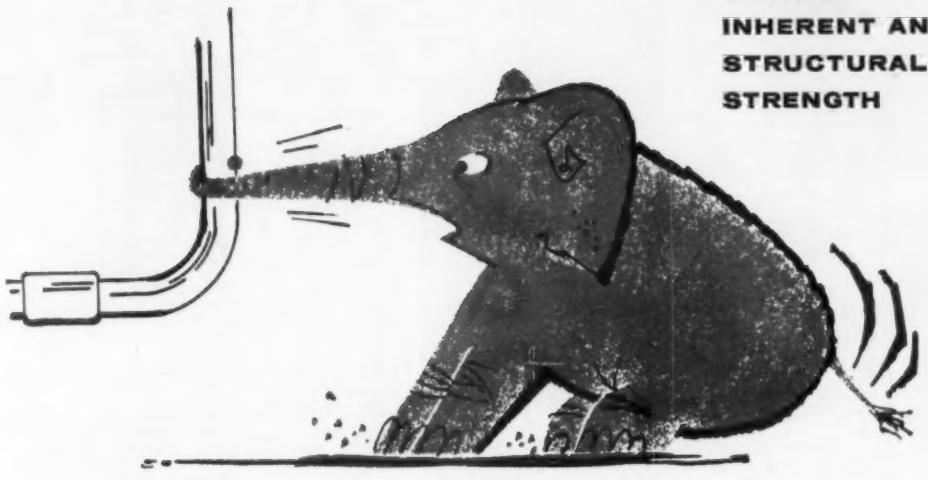
WINCHESTER-WESTERN DIVISION • OLIN MATHIESON CHEMICAL CORPORATION
12105-E BEREA ROAD • CLEVELAND 11, OHIO

IN RETRACTED position lowered crane boom parallels truck side, is held by coil spring clip. Note promotional touch added by decal on side of boom.

loading of pick-up trucks. The boom has an 8-ft beam (8-in. I-beam section) which swivels 360 degrees on a sturdy pipe pedestal with a 36-in. dia. base securely anchored to the floor some 3 ft inside the building wall. When swung out through the door, the swing-boom extends about 5 ft beyond the building and over the truck bed. A 1-ton electric hoist travels the length of the beam. Clearance from bottom of beam to shop floor is approximately 8 ft. The boom also serves a large lathe just inside the loading dock; is used to position large rotors and shafts in the lathe; can be used to transfer such units directly from truck to lathe, or vice versa, if desired. A fluorescent fixture, pully mounted over the lathe, can be raised to swing rotors and lowered to correct height for high-intensity working illumination.

Most recent extension of material handling ease to field operations is the addition of ½-ton hydraulic cranes to Wayne Electric's pick-up trucks. These compact, inconspicuous units permit one man to pick up or deliver motors on customer premises with a minimum expenditure of time and physical effort. This Atlas crane is a simple arrangement of a 43-in. steel channel "boom" hinged to a U-shaped steel bracket supporting a pin-mounted hydraulic jack. As the removable jack handle is pumped, the hydraulic plunger raises the boom through about a 90 degree arc—from slightly below horizontal to almost vertical position. An adjustable chain hook on the end of the boom is used with motor slings.

The truck crane assembly telescopes in and swivels on a 19½-in. high pedestal of 3-in. pipe with a steel plate base and welded flanges. Base and flange are bolted to the



this is one of the 10 reasons why

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CONDUIT IS BETTER

1 Greater inherent and structural strength
2 No special exterior preparation needed for concrete installations
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5 Easier to fish with a tape
6 Compatible with all building materials
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9 Immediate delivery from distributors and mills

10 Proven for more than a half a century in millions of installations

CLAYTON MARK, pioneer in electrical conduit since 1910, specializes in producing steel conduit that meets all building specifications. Our facilities, engineering and production know-how guarantee quality products accepted as "The Contractors' Favorites" in the industry—Electrictube, Hotkote, Galvakote and Enamelkote.

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Please send me your booklet
"Why Steel Conduit Is Better"

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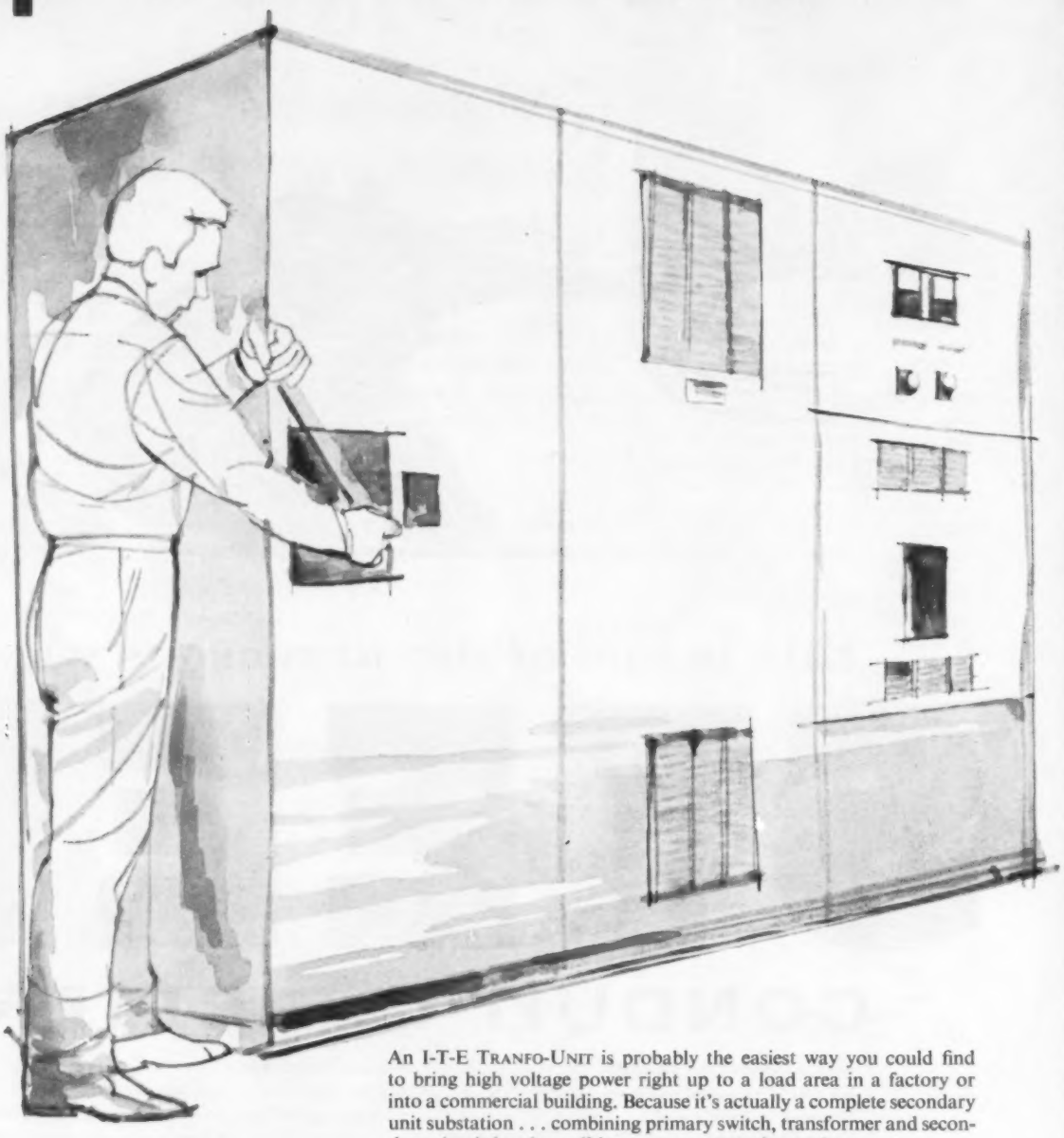
Address_____
City_____ State_____

CM-4810

I-T-E CIRCUIT BREAKER COMPANY



EASY

An I-T-E TRANFO-UNIT is probably the easiest way you could find to bring high voltage power right up to a load area in a factory or into a commercial building. Because it's actually a complete secondary unit substation . . . combining primary switch, transformer and secondary circuit breakers all in one neat, attractive package.

A TRANFO-UNIT is *delivered* as one package too (in all but the very largest sizes), so installation is very easy. Just put it in place, connect the leads, and that's all there is. No time-consuming handling of countless separate pieces of equipment.

You can order TRANFO-UNITS pre-engineered to your own particular application requirements . . . in a wide range of ratings up to 3000 kva. Available for both indoor and outdoor installations. Since they're completely self-contained, they require minimum floor space and no fence.

How much does this extra convenience and safety cost? No more than hodgepodge arrangements of assorted gear. The TRANFO-UNIT is more evidence of I-T-E's constant policy: to give more value at no extra cost. Do you use I-T-E electrical equipment? If not, why not?

Circuit breaker protection for single circuits. Use I-T-E URELITE individually enclosed power circuit breakers to protect large load single circuits in factories and as power entrance devices in many commercial buildings. Easy to install. Extra roomy cable box makes it easy to pull and bend cables. All mounting equipment and contact assemblies can be removed for installation. Box can accommodate cables one size larger than standard and still leave working room. Provision for four conduits at both top and bottom of box means utmost flexibility in cabling. Enclosure is shipped separately. During installation, breaker remains in protective carton

Switchgear easy to install. I-T-E metal-clad switchgear reduces installation effort to an absolute minimum. Base frame is shipped in advance for setting into floor. Switchgear arrives preassembled in large units for quick positioning and connection. Very little actual assembly work required. Sturdy construction makes possible required handling without risk of frame distortion. Units are engineered and manufactured with care to insure that they will fit accurately together at the site. Their quality construction means customer satisfaction.

Space saver . . . cost saver. Big protection in small size. I-T-E CORDON® circuit breakers combine the space and cost economy of molded case construction with interrupting capacity of up to 100,000 amp. They cost approximately one-third less than alternative devices and require only half the panel space. Available loose or individually enclosed in a broad range of ratings for a wide variety of applications. Especially valuable for circuits fed by high-current capacity lines.

SEND COUPON OR WRITE

Get complete, up-to-date information on I-T-E equipment.

I-T-E Circuit Breaker Company CO-2
1900 Hamilton St., Philadelphia 30, Pa.

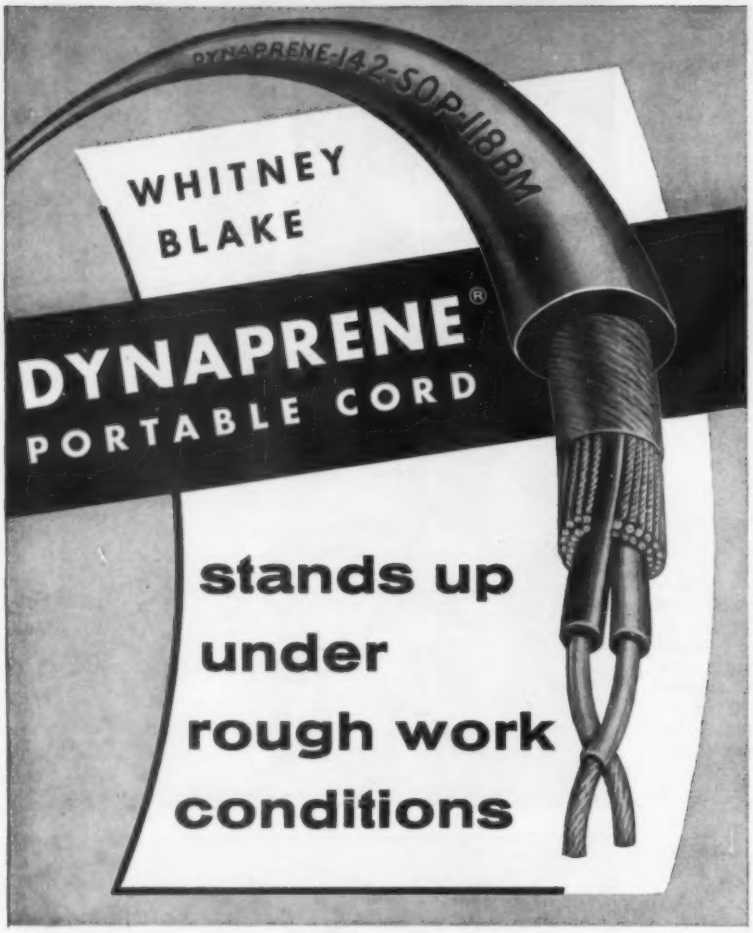
- ☐ TRANFO-UNITS
- ☐ URELITE circuit breakers
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ CORDON circuit breakers
- ☐ Molded case circuit breakers
- ☐ Power switching centers
- ☐ Metal-enclosed bus
- ☐ Secondary unit substations
- ☐ Other .....

Name.....Title.....

Company.....

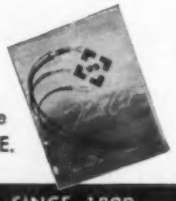
Street.....

City.....Zone....State.....



Where portable cord takes a beating because of rugged work conditions, WHITNEY BLAKE DYNAPRENE stands up and gives long, economical service.

DYNAPRENE has an especially tough neoprene jacket, it resists abrasion, has high flexibility and long flex life, and provides premium quality service at competitive prices.

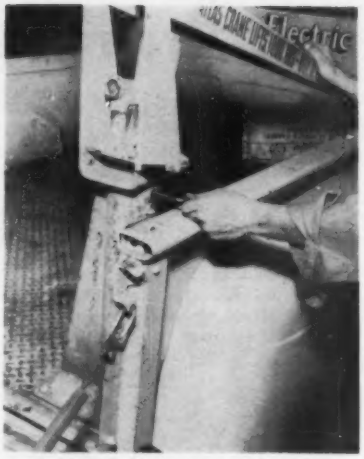


Write TODAY for this complete catalog . . . FREE.

WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE COMPANY

NEW HAVEN 14, CONNECTICUT



PIPE PEDESTAL with sturdy flanges is bolted to floor and side of truck. Crane swivels 360 degrees. Locking pin (arrow) through pedestal and telescoping base prevents side sway of retracted boom during transit.

truck bed and side near the tail board. When in transit, the lowered crane boom parallels the truck side and is held in position by a coil spring "retainer." A locking pin, passing through the telescoping base and pipe pedestal, prevents boom side sway and back lash when the truck is in motion.

At present, conventional blocks are being used to keep the truck bed on an even keel during loading and unloading. Wayne mechanics are now working on the design of an automatic device which, after being manually set before the crane is used, will snap back into position when the truck moves forward.

Wayne Electric, who uses and sells the hydraulic truck crane, employs a bit of clever promotion. On the side of the boom facing the passersby is a decal reading "Atlas Crane Lifts 1000 Pounds—Buy It From Us." Next in view is the name Wayne Electric Co. across the back of the truck cab. For industrial customers watching their equipment being loaded or unloaded, the visual message is there—what it is, what it does, where to get it.

V-Belt Brake Steadies Rotors in Work Stands

A common shop practice when inserting coils in large, heavy armatures is to support the rotor on a pair of pedestals equipped with rollers or bearings on which the shaft will rotate. Unless some type of braking device is used, the rotor tends to shift position when the coils are being placed in the slots

IDEAL THE HELPING HAND ON EVERY WIRING JOB

Mr. Contractor:

Guessing is for Games...

Not for choosing wire connectors -- the most critical part of your wiring job!

No electrical system is any better than its poorest connection. Can you *ever* afford to risk a splice that's less than the best—for your customer, the job and *your profits?*

Look at it this way: Just one bad-splice call-back can cost you more than 1000* perfect IDEAL "Wire-Nuts". That's one reason why *more* "Wire-Nuts" are used by *more* contractors than any other connector. Quality-proved by more than 33 years of on the job experience, with *billions* now in service, they constitute visible proof to your customer of the extra safety and quality "built-in" to your wiring installations . . . You can pay *much* more, but you can't get a better, longer-lasting connection at any price. On every job, BE SAFE and STAY SAFE with IDEAL "Wire-Nuts"

*The extra safety and security of 1000 "Wire-Nuts" costs as little as $13.10 *total!* Can you make a call-back for less?

All contractor sizes are listed as pressure cable connectors, for general use (600 V) in branch circuit and fixture wiring.

"Wire-Nuts" don't just join wires, *THEY CRUSH 'EM TOGETHER IN A LIFETIME GRIP*

Screw-and-lever and wedge action with FORCE UP TO 2½ TONS flattens wires and multiplies contact area.

SHAKE-PROOF! PULL-PROOF! FLASH-PROOF! HEAT-UP PROOF!

You Know You're Safe with

IDEAL WireNut® CONNECTORS

Sold through AMERICA'S LEADING DISTRIBUTORS

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Please send full catalog data on IDEAL "Wire-Nuts"

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Company_____

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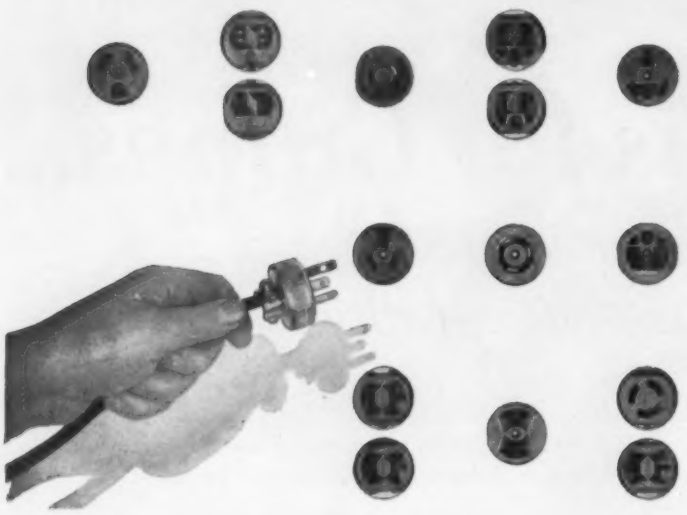
INDIVIDUAL PROTECTION STATIONS



SAFELETS

now available with a wide variety of receptacles and circuit breaker ratings

The Heinemann Safelet is a compact unit that neatly combines circuit-breaker safety with plug-in convenience. It has hundreds of applications, can be used for the individual protection of power tools, fractional horsepower motors and almost all general appliances.

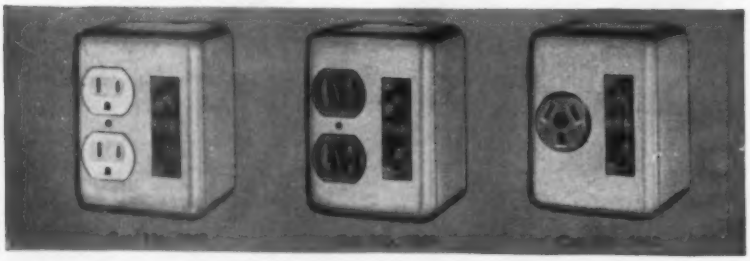
Now you can have the Safelet with any of a large number of receptacles, single and duplex, in twist-lock, polarized, "T" slot and other styles.

And now you can have a wide choice of circuit breaker ratings: from 6 to 50 amperes, at the most commonly used a-c and d-c voltages.

The Safelet enclosure is made of 16-gauge steel with an attractive grey hammertone finish. Units are available for either flush or surface mounting.

Of course, the circuit breakers used are Heinemann breakers . . . long accepted by the electrical industry as the standard of performance.

For full details, send for Bulletin 1000.



HEINEMANN

ELECTRIC COMPANY

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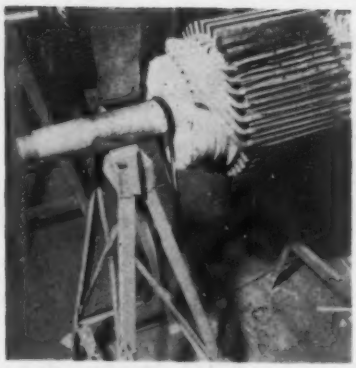


V-BELT over rotor shaft maintains slot position for coil insertion when tension is applied with foot lever. Shaft rests on pedestal rollers.

FOOT LEVER at base of pedestal secures other end of twisted belt; can be quickly set or released as mechanic desires.

or the weight unbalance of the added coils will cause undue rotation. When this happens, the mechanic loses valuable time fighting rotor shift.

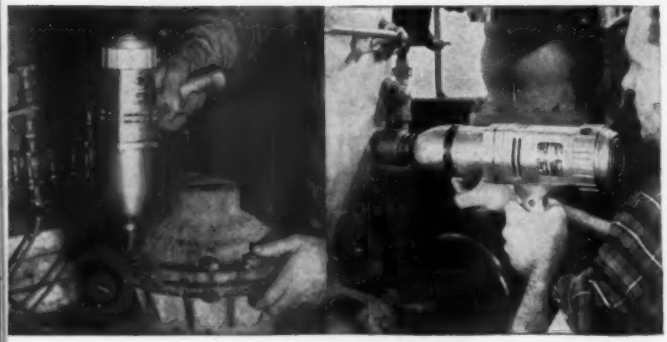
Mechanics in the large motor repair department of Electrical Engineering & Equipment Company, Des Moines, Iowa, have solved this problem by devising a simple V-belt brake which can be quickly set or released by a foot lever. Heart of the device is a conventional rubber V-belt of selected length to fit pedestal height. One end of the belt goes around the rotor shaft; the other end, after several twists to adjust tension, goes around a retaining disc on a foot lever at the base of the pedestal.

The quick-set, quick-release feature is an effective time-saver. When the brake is "set," the foot lever is held in a horizontal position by a slightly tapered retaining block near the base of the A-frame pedestal. Tension of the stretched V-belt and friction of that part around the rotor shaft holds the rotor in working position. To release the brake, the mechanic merely applies a downward and

MILLIONS SPUN
with practically
NO TOOL REPAIR

Try one on your jobs...

For general maintenance work, try the No. 100—powerful enough for most jobs; light, easy to handle. And for the tougher jobs where extra torque is needed, nothing's better than the No. 300. Handles easy, too!



Look Under "TOOLS-ELECTRIC" in 'Yellow Pages'

Black & Decker®

Quality Electric Tools . . . Power-built to set the pace

Thousands of B&D Impact Wrenches have been sold . . . few serviced. Records of Black & Decker Service Branches reveal that the No. 100 and 300 Impact Wrenches are virtually strangers to them.

We expected these tools to stand up like this. They were built to withstand the great strain, the high impact stress common to impact wrenches—long known as high-maintenance tools. Before a single B&D Impact Wrench was sold we torture tested impactor springs by compressing 'em 100 million times; ran tools continuously over 600 hours.

Try 'em both. Mail coupon for free demonstration.

THE BLACK & DECKER MFG. CO., Dept. 1206, Towson 4, Md.

☐ Arrange a free demonstration of your ☐ No. 100; ☐ No. 300
☐ Send me information on Impact Wrenches.
☐ Send me information on Tools checked below.

Name..... Title.....

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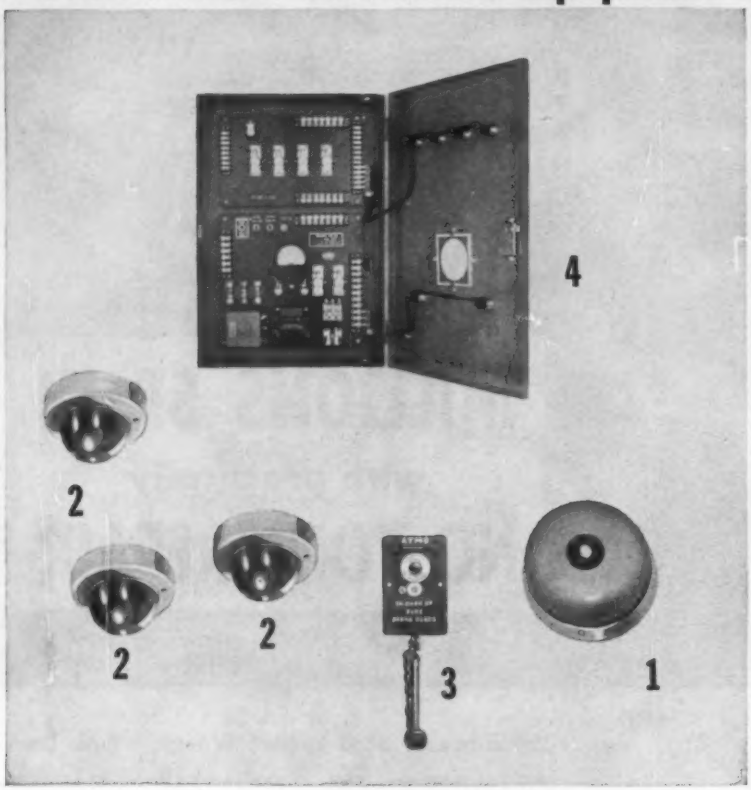
City..... Zone..... State.....

☐ Drills ☐ Hammers ☐ Vacuum Cleaners ☐ Belt Sanders

Fire detection is big business! Cash in now with Kidde equipment!



For years, schools, public buildings, businesses and homes have been waiting for an inexpensive, dependable fire detection system approved by U.L. and F.M. Now *you* can sell them this vital detection system at a *reasonable* price. Whether you sell Kidde system components on an install-it-yourself basis, or do the actual wiring job, there are thousands of dollars in potential profits for you.

And, selling Kidde, you can be sure that you're selling quality. For more than 30 years, Kidde has been the leader in fire safety. It's a name you and your customers can trust!

Find out more about Kidde fire detection components – and how you can use them to cash in on these most profitable markets! For more information, write to Kidde today.

1. Kidde alarm bells – 6", 8", and 10" diameter, U.L.-approved.

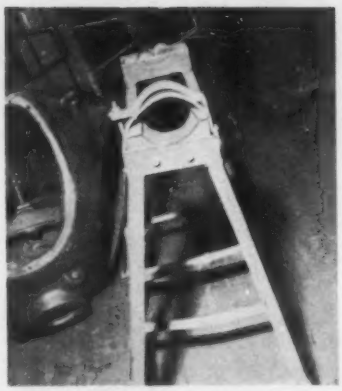
2. Kidde Fyrindex detectors. Self-resetting, fast-acting, easy to install. Fixed-temperature units each protect up to 225 sq. ft. Rate-of-temperature-rise models protect to 900 sq. ft. Combination rate-of-rise, fixed temperature units each protect 2500 square feet. All U.L. and/or F.M. approved.

3. Break glass manual alarm. One or more stations.

4. Control, rectifier, zone annunciator panels contained in one cabinet. Monitors up to ten zones. 12 or 24 v., dc.

Kidde Kidde Ultrasonic & Detection Alarms, Inc.
685 Brighton Road, Clifton, New Jersey

A Subsidiary of Walter Kidde & Company, Inc., Belleville 9, N. J.



METAL BRAKE shoe with fiber block base and adjustable tension bolt replaces pedestal rollers to position large armatures for coil replacement.

slightly outward foot pressure to "unlatch" the lever. Without tension, the belt returns to normal length and fits loosely around the rotor shaft which can be hand rotated to the next group of slots. Complete foot operation of the brake keeps the mechanic's hands free at all times.

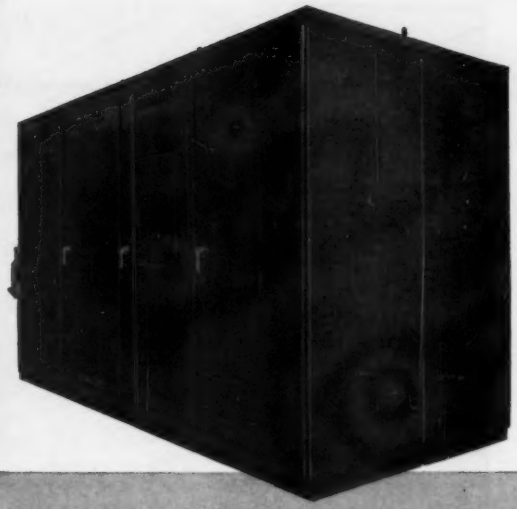
For larger and heavier armatures, a different type of brake is used. Here, the rollers of one pedestal are replaced with two ¾-in. wide fiber half-blocks bolted in the roller recess and cut out to seat the rotor shaft. A steel-strap brake shoe, fixed at one end and free at the other, lined with web belting fits over the top of the shaft. Tension is provided by an adjustable bolt arrangement at the free end.

SHEET INSULATION storage bin at L. R. Klose Electric Co., Kalamazoo, Mich., has 15 sections with drop-front access panels. Overall dimensions of ¾-in. wood bin are 92 ins. high, 46 ins. wide and 40 ins. deep. Individual sections have 5⅛-in. height; have number, type and insulation thickness stencilled on drop panels.

Quality Electric Tools . . . Power-built to set the pace

☐Drills ☐Hammers ☐Vacuum Cleaners ☐Belt Sanders

for high voltage service continuity on your critical loads at lower capital outlay— it's S&C Metalclad Switchgear!

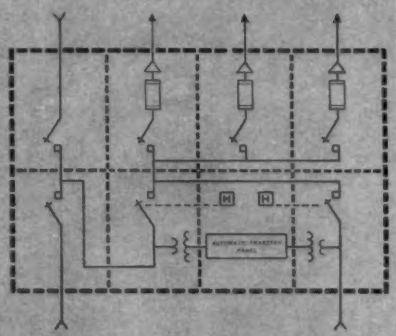


To get service continuity on critical loads, you need preferred-to-emergency switching of your alternate incoming high-voltage supply circuits, and short-circuit protection and switching on your outgoing high-voltage supply feeders. All of this can be provided in one low-cost package in S&C Metalclad Switchgear, as illustrated.

You even have built-in choices of throwover schemes through S&C's standard automatic transfer panels.

You save two ways:

1. You get metalclad switchgear with job-matched load interrupters and power fuses, in lieu of costly circuit breakers.
2. You eliminate cost of custom designing by using an off-the-shelf transfer panel with built-in options.

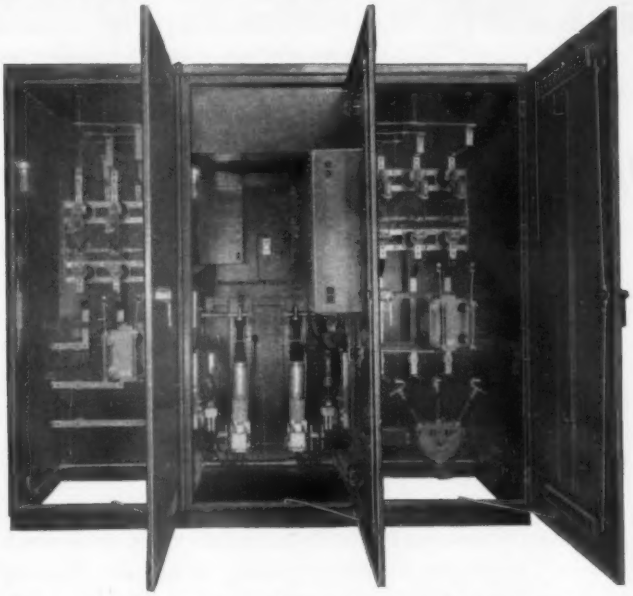


Schematic for 8-bay switching center unit (above) shows throwover control of 2 of 3 alternative incoming sources to provide continuous service for three outgoing feeders.

No organic insulation to cause corona trouble; porcelain and air only.

High-Speed Automatic Switching.

Full-length bulkhead doors; rainproof, with complete access.



S&C Standard Automatic Transfer Panel provides for making either source preferred, for automatic or manual return, for adjustable time delays, for choice of returning in either open or closed transition, and for optional lockout on bus faults.

Super Durabake finish with galvanized and stainless steel hardware; withstands corrosive atmospheres.

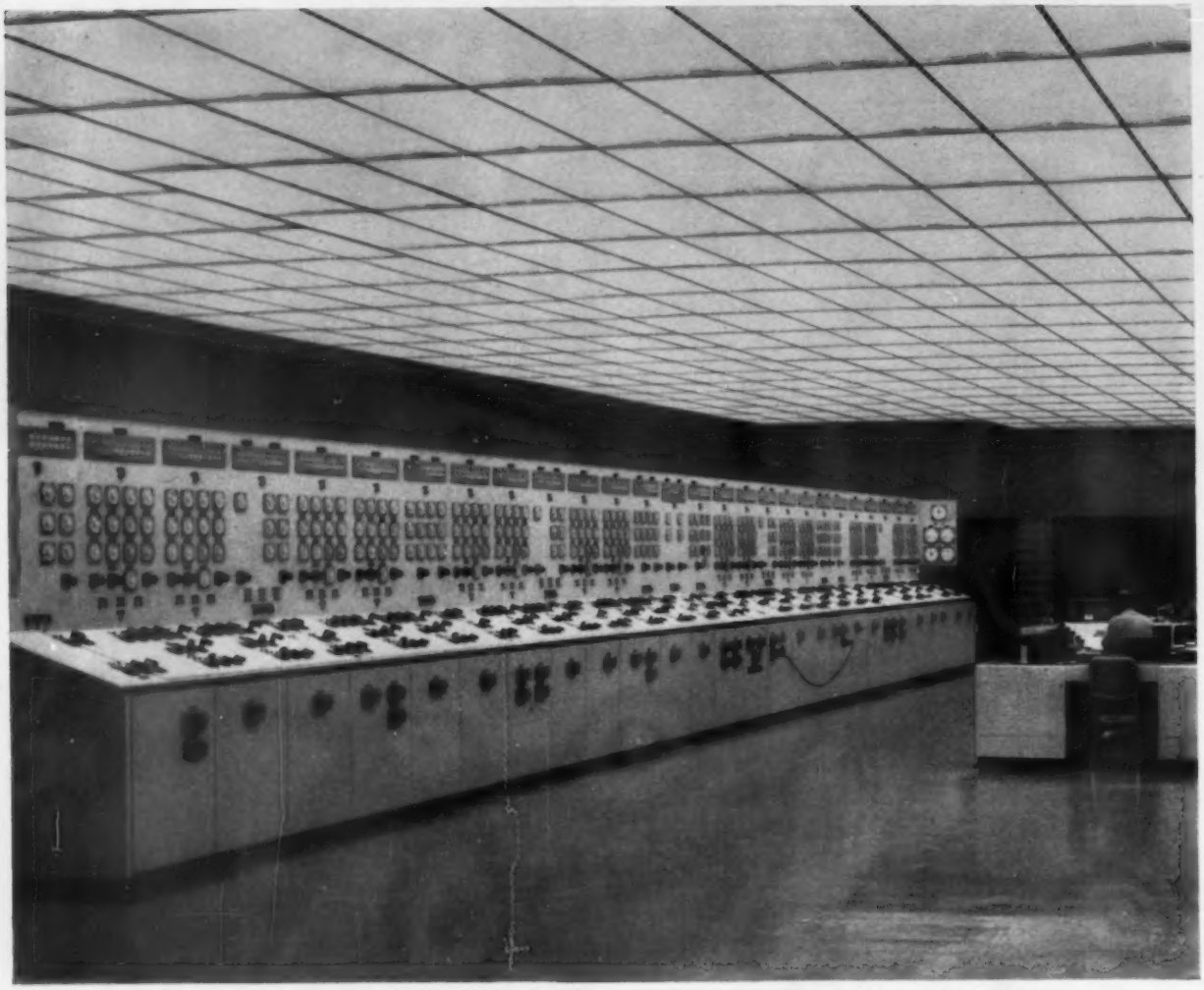
Separate compartment for Moto-Draulic operators; free access and decoupling for checkout.

Strip heaters with adequate venting prevents moisture accumulation.

Power Fuses
Tool Operated Disconnects
Open and Enclosed Cutouts
Fuse Links
"Loadbuster"
Load Interrupters
Metalclad Switchgear

S&C ELECTRIC COMPANY
4433 Ravenswood Ave., Chicago 40, Ill.

In Canada: S&C Electric Canada, Ltd.
8 Vansco Road, Toronto 14, Ontario



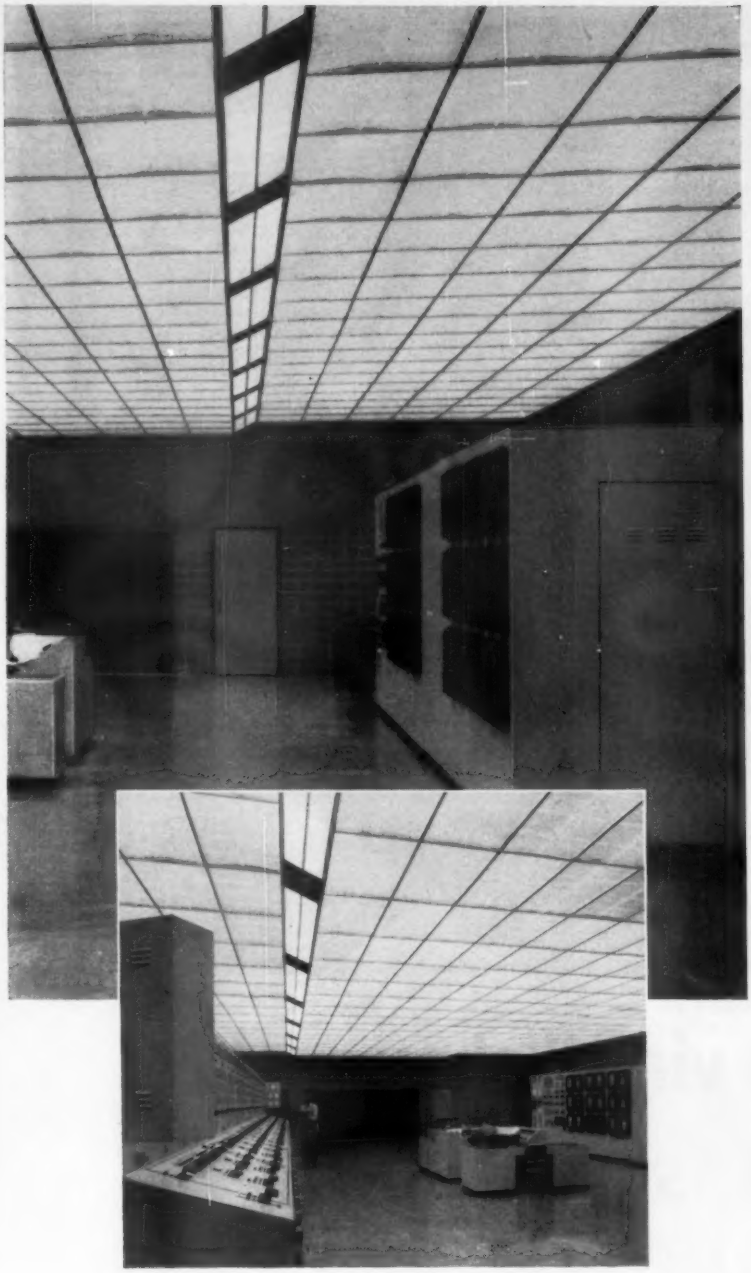
Photos Courtesy of the Power Authority of the State of New York

A Great "Team Job" of Functional Lighting

...WITH FIXTURES BY LITECONTROL

Challenging project, rewarding solution, beautifully functional. These six words sum up what may well be one of the most inspired lighting jobs of the year — the Control Room of the Robert Moses Power Dam, St. Lawrence Power Project. The engineers and the electrical contractor working with Litecontrol fixtures responded to the challenge and the result is self-evident.

One notes immediately the two ceiling levels which result from the tilted position of the board lighting troffers. These have asymmetric lenses which illuminate the boards and their meters *evenly* from top to bottom. Air conditioning outlets are designed into the row of



INSTALLATION:
Robert Moses Power Plant Control Room,
St. Lawrence Power Project,
Massena, New York

ENGINEERS:
Uhl, Hall & Rich, Boston, Massachusetts
(an affiliate of Chas. T. Main, Inc.)

GENERAL CONTRACTORS:
B. Perini & Sons, Inc.,
Sponsors of joint enterprise
Walsh Construction Company
Morrison, Knudsen Inc.
Peter Kiewit Sons Company
Utah Construction Company

ELECTRICAL CONTRACTOR:
Electrical Constructors, Columbus, Ohio

DISTRIBUTOR:
General Electric Supply Company, Buffalo, N. Y.

ROOM FINISHES:
Upper Walls — White, tinted Aqua Green
Lower Walls — Seaspray Green Ceramic Tile
Floor — Coralette Rubber Tile
Control Boards — Pale Yellow

CEILING HEIGHTS:
11′ — 3″ and 11′ — 9″

LIGHTING SYSTEM:
Litecontrol Lens Ceiling, using Holophane #6024 acrylic CONTROLENS*, with F40T12/WW/RS warm white rapid start lamps on dimmer controls, 24″ on centers. Board lighting — 2 lamp troffers, using Holophane #9010 asymmetric CONTROLENS* and F40T12/WW/RS lamps.

INTENSITIES:
Average, 30″ from floor, lamps on full, 152.8 footcandles. Lamps on ½ dim, 94.3 footcandles. Average vertical reading on face of boards, 75 footcandles; at edge of bench board, 55 footcandles. (All in service)

BRIGHTNESS:
Across axis of lens ceiling:
15° from horizontal, 150 footlamberts
30° from horizontal, 175 footlamberts
45° from horizontal, 200 footlamberts
90° from horizontal, 225 footlamberts

At supplementary troffers, across axis:
15° from horizontal, 339 footlamberts
30° from horizontal, 389 footlamberts
45° from horizontal, 425 footlamberts
90° from horizontal, 476 footlamberts

Figures courtesy Uhl, Hall & Rich
*Reg. Holophane Company, Inc.

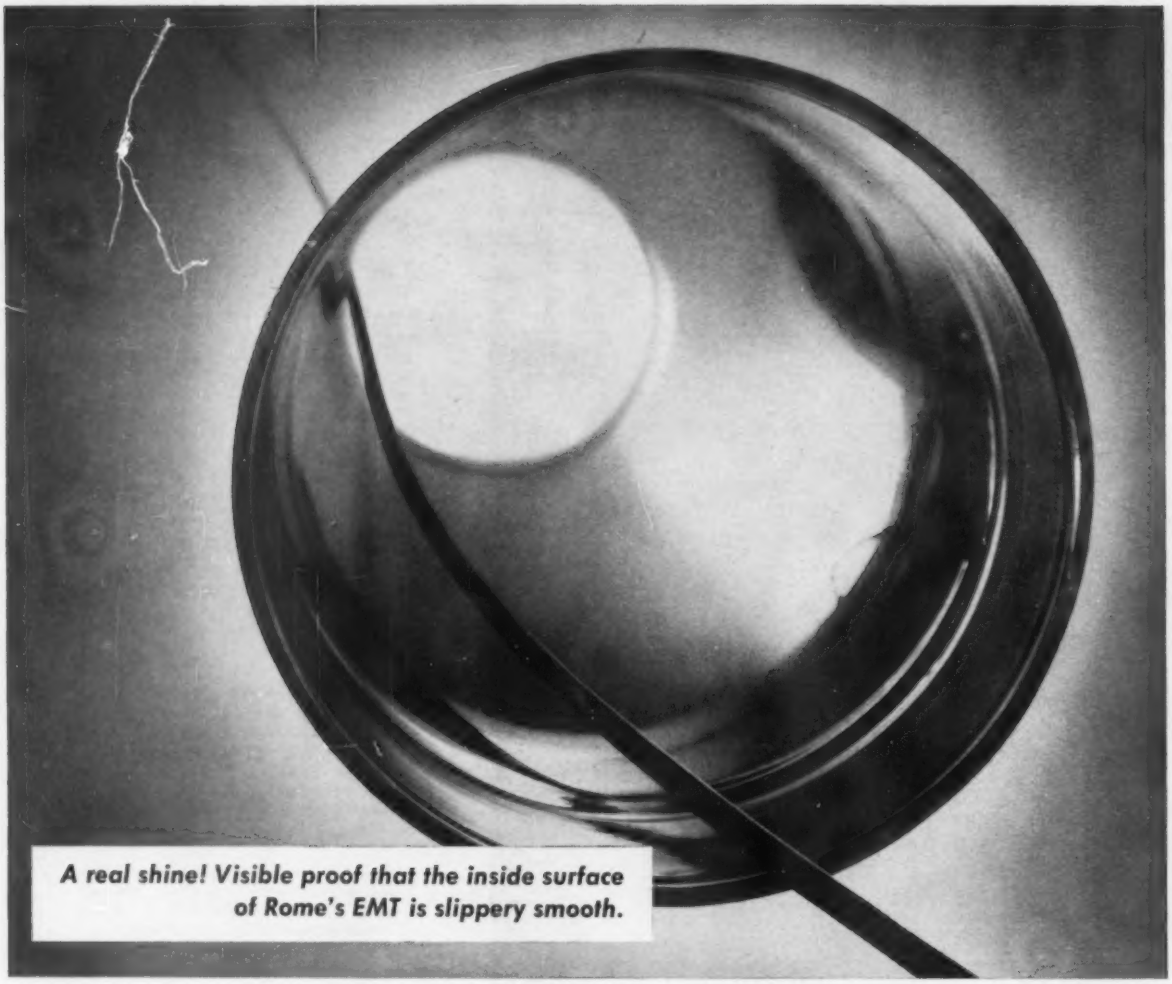
troffers — these outlets and troffers are all supported by the lens ceiling structure.

Our lens ceiling with 880 Holophane acrylic lenses (about two feet square each), provides high intensity overall while keeping brightness exceptionally low. (See table.) It also eliminates reflected glare from the meter faces. Dimmers permit any intensity from the full 152.8, down to 2 footcandles.

This is a big lighting job, but our major interest at Litecontrol is not how big but how well. Can we help *you* on *your* next installation?

LITECONTROL
Fixtures
KEEP UPKEEP DOWN
LITECONTROL CORPORATION,
36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



A real shine! Visible proof that the inside surface of Rome's EMT is slippery smooth.

"Tape's eye view" shows why Rome's EMT is easiest to fish

That shine you see is the reason fish tape won't "hang up" when you use Rome's EMT.

The slick interior finish of Rome's EMT lets your fish tape slide through with an absolute minimum of resistance. Careful baking—under rigid control—produces a uniformly smooth enamel-like finish inside Rome's EMT.

In a test conducted by the Anstice Company, a completely unbiased party, Rome's EMT came out first in fishability. Three ten-foot lengths of ½" EMT, Rome's and two competitive samples, were formed into identical figures containing eight bends. The ⅛" fish tape used in the test easily passed through the eight bends in Rome's EMT, but "hung up" on one of the bends in both competitive samples.

Strong weld In another test to determine the strength of the weld on Rome's EMT, a sample was squeezed, flared, flattened, and expanded. In each case, the weld proved to be as strong as the metal itself.

Easy bending The strength of Rome's EMT interferes in no way with its ductility. You can make bends—even intricate ones—quickly and easily.

Corrosion resistance A uniformly electrogalvanized exterior finish protects your installation against corrosion. Long dependable service life is assured.

Use easy-fishing, easy-bending Rome EMT on your next job. Contact your nearest Rome Cable representative for more information—or write to Department 905, Rome Cable Corporation, Torrance, California.

ROME CABLE

CORPORATION

Practical Methods

Separate Areas of Drug Store Defined by Lighting Variety

LIGHTING

A 3-fold lighting plan that effectively separates a general display area from specialty sections devoted to the sale of cosmetics and the preparation of prescriptions is a feature of the Village Drug store in Fresno, Calif. And, combined with the adoption of pleasing color motifs plus novel wall surfacing in brick and redwood, the store is attracting considerable business and local approval.

Throughout the open central section, illumination in the order of 85 footcandles is provided through the general medium of 4-lamp 8-ft cool-white deluxe slimline fixtures, equipped with louvered bottom panels and stem-suspended 8 ins. below the acoustically tiled ceiling. In addition, a series of adjustable 200-watt PAR46 spot and floodlights, incorporated into annular-louvered air-conditioning and lighting combination assemblies, are functionally positioned and aimed to highlight special displays.

GENERAL ILLUMINATION is provided by 4-lamp, 8-ft, stem-suspended slimline fixtures having louvered bottom panels and luminous sides. Lamps are WWX, operating at 800-ma. Accent of merchandise is obtained where necessary by series of adjustable 200-watt floodlights incorporated into combination lighting.

COSMETIC DEPARTMENT combines diffuse general illumination with properly shielded accent lights and ornamental triple-hourglass luminaires. Multiple circuiting and switching arrangements permit lighting mediums to be combined into variety of patterns. Objective of lighting design was to compliment customers' complexions while creating environment having feminine appeal.

Combining these fluorescent and incandescent lamps has resulted in good color renditions and, due to the open-top construction of the suspended fixtures, upward spill-light tends to minimize ceiling-fixture contrast ratios which might be objectionable otherwise. Suspension and open-top construction of units also promotes sufficient circulation to keep operating temperatures of 800-ma ballasts within permissible limits.

Arranged to coincide with contours of counters and display gondolas, this arrangement places light where it is most useful in the creation of quality seeing conditions for selling.

Colors in this area include an 85% RF flat-white ceiling, walls of 45% RF pomegranate with 20% RF masonry and redwood accents, floor tiling of 50% RF off-white and gray, plus blond furniture that maintains the bright overall environment.

Feminine appeal and attention to customers' complexions were the obtained objectives in the cosmetic department, where 4-lamp 8-ft slimline fixtures equipped with textured plastic bottom panels are suspended in a variety of modular shapes and formations. Then, to spotlight special displays on countertops, semi-recessed adjustable 150-watt PAR38 units were located as required. Another element of variety was also added by suspending triple hourglass-shaped fixtures 18 ins. from the ceiling level, up- and down-lights in these assemblies being separately circuited and switched to permit creation of varied effects. General illumination in this area is pleasingly diffuse, although properly-shielded spotlights are liberally supplied for accenting purposes.

As noted in the rear-center of an accompanying photo, the prescription department is clearly defined by a large luminous panel that produces 155 fc of shadowless illumination in this important section of the store.

Design of the lighting plan was the result of cooperative contributions by Atlas Electric Service, by McKesson & Robbins' design consultant, and by Pacific Gas and Electric lighting engineer Irwin McMath.

General Electric announces the most efficient and economical 40-watt fluorescent you can buy

THE PREMIUM 3

3100 lumens

(Same preferred cool white as before)

Gives customers 17% more light from present fixtures!

G-E PREMIUM 3 Lamps give your customers the lowest over-all cost of light of any 40-watt lamp. Three new innovations provide added light worth more than the cost of the lamps themselves: 1) more efficient phosphors, 2) newly designed electrode mount, 3) new current-carrying gas mixture.

G-E PREMIUM 3 Lamps, the latest example of General Electric's lamp development, give your customers more for all their lighting dollars. G-E *Premium 3* Lamps operate on Rapid Start or Pre-heat (starter-type) circuits—and will be widely used to make existing systems deliver more light at virtually no added cost. Available in limited quantity in May, list price $1.45.

On Rapid Start circuits G-E *Premium 3* Lamps have a 7,500 hour rated life; 5,000 hours on Pre-heat circuits. Write for the whole story on this new dimension in fluorescent lighting. General Electric Co., Large Lamp Dept. C-926, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

G-E PREMIUM 3

now joins these other outstanding "firsts" in fluorescent lighting . . . all introduced by General Electric!

1938—FIRST FLUORESCENT. This was the year General Electric announced the first practical fluorescent—a revolutionary new and efficient lighting tool.

1939—FIRST 40-WATT. Predecessor to today's highly efficient 40-watt fluorescents—opening the way for the new G-E *Premium 3* Lamp.

1946—FIRST SLIMLINE. This single pin lamp, the first practical 8′ tube, provided more attractive lighting systems, quicker lamp changing, instant starting.

1952—FIRST RAPID START. This G-E development brought faster, flickerless starting *without starters*—and cut maintenance costs, too.

1954—FIRST HIGH OUTPUT. Delivered half again as much light as slimlines, more light from equal fixtures, for big investment savings.

1956—FIRST POWER GROOVE. This revolutionary, grooved lamp gave 2½ times the light of slimlines; saved 5-20% on initial investment.

1959—NEW POWER GROOVE. The most powerful fluorescent you can buy. Double row of grooves helps increase light output 12%, to 15,000 lumens for 8-foot length.

Progress Is Our Most Important Product

GENERAL ELECTRIC

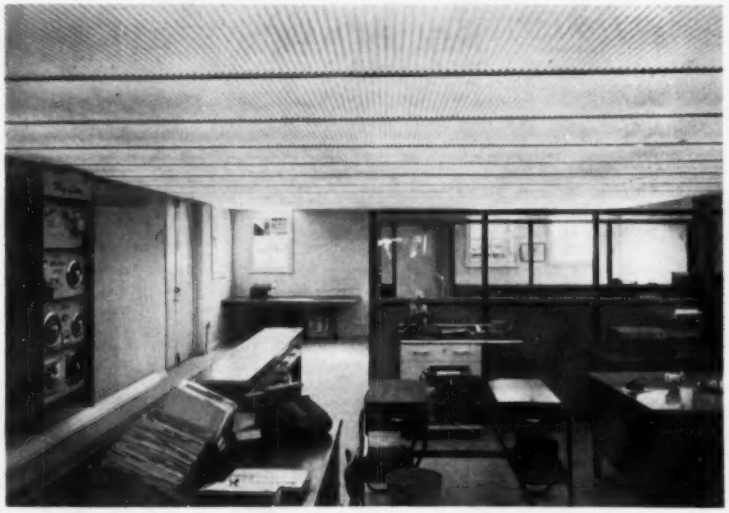
Contractor Modernizes Office with Prefab Luminous Ceiling

LIGHTING

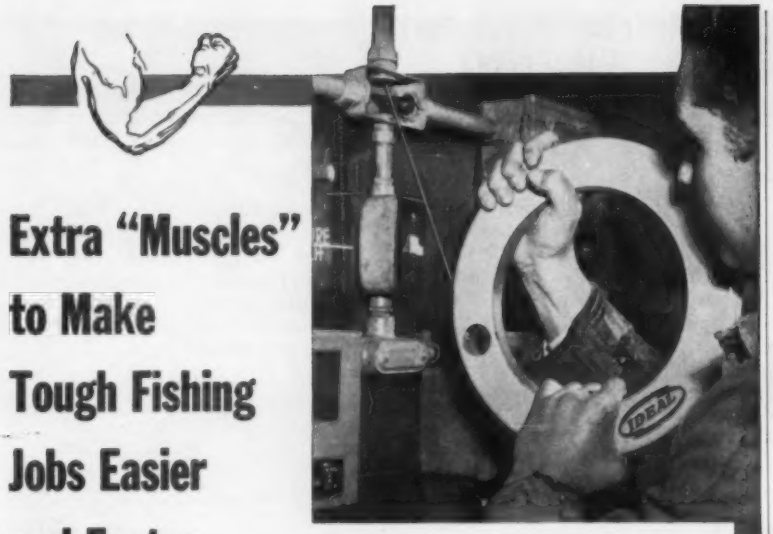
Trowbridge Electric Co., Roseburg, Ore., takes pride in its home-office lighting installation, for this 100-fc feature serves the dual purpose of providing even illumination with low brightness and minimum glare for drafting, bookkeeping and routine paper work, while simultaneously demonstrating practical lighting techniques to potential customers.

The installation, however, has several other related advantages as well, for the two 18-by-24-ft Wakefield Magic luminous ceiling panels closely coincided with the overall dimensions of the area which was modernized by their use. This eliminated the need for local framing or fitting of components. And, since perimeter angles, aluminum tee bars, spacers and hangers were dimensioned, formed and drilled prior to delivery, the ceiling was

WIRING CHANNELS, grid supports, T-rails, spacing bars and perimeter framing angles were drilled prior to delivery, thereby reducing necessary local time and effort required on the actual jobsite. Since translucent corrugated panels installed beneath this assembly effectively hide cracks and imperfections, the only additional work consisted of painting cavity a flat white.



SIMPLICITY is achieved by this "packaged" luminous ceiling consisting of two 18- by 24-ft prefabricated sections. Cool-white fluorescent lamps, mounted end-to-end with rows on 3-ft centers and extending in the same direction as the T-bar panel-supporting grid, produce maintained illumination level of 100 fc on desks and drafting boards in this modernized office.



Extra "Muscles" to Make Tough Fishing Jobs Easier and Faster

IDEAL

FISH TAPE, REEL and PULLER

Standby of electricians for close to a generation, IDEAL Fish Tape, Reels and Pullers can help you do any wiring job faster and easier. They're like an extra arm or bigger muscles—make pulling easier and safer. The reel gives you the leverage you need — and keeps the tape always in the reel or conduit. The tape can't spring loose into moving machinery or "hot" lines.

You reel in and pull the tape through conduit in one easy operation . . . no skinned fingers —no cuts—and no lost time! The tape never gets snarled.

Saves work—saves time—saves money! The IDEAL Fish Tape Reel and Puller costs so little you can't afford to be without it! 50 to 200 foot lengths—all tapes are of finest grade, oil tempered flat spring steel.

Now Step Up the Performance of Your IDEAL Fish Tape, Reel and Puller with the

NEW IDEAL FISH TAPE WINDER

Makes IDEAL Fish Tape Reel Even More Useful

Reduces still further the work of fish tape pulling when used with an IDEAL Fish Tape Reel. As Winder is pulled around Reel it spreads the Reel housing so that the tape can be reeled in or out with least effort. Double rollers hold Winder in place as handle is rotated. Three sizes for all IDEAL Reels.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

In Canada: Irving Smith, Ltd., Montreal

IDEAL INDUSTRIES, INC.
1041-F PARK AVENUE, SYCAMORE, ILLINOIS

Please send catalog data on IDEAL Fish Tapes, Reels and Pullers and Fish Tape Winders.

Name_____

Address_____

Company_____

City_____ Zone____ State_____

IDEAL

practically a "packaged" unit which was installed with minimum time and effort required.

Still another advantage was related to the concealing character of the suspended translucent ceiling, for it effectively hid cracks and other imperfections in the true ceiling, thereby making it unnecessary to undertake ceiling refinishing. Moreover, by using rapid-start ballasts and cool-white fluorescent lamps, lumen output on a wattage basis and noise levels were found to be quite satisfactory.

Reflectance values, both above and below the suspended ceiling, are high, for the ceiling cavity was painted a flat white, while walls and flooring are light tan and cream respectively.

Installation details consisted of first establishing a centerline for the room, securing fixture chassis directly to the ceiling along this axis. Parallel runs were then installed on either side of this line and the wiring was completed. Supporting rods for the corrugated plastic ceiling panels were likewise installed, in pre-drilled socket holes, and angle irons were secured to walls to form the perimeter framing medium. After T-bar spacers were inserted, connection clamps were tightened and all lamps and corrugated panels were installed to complete the job.

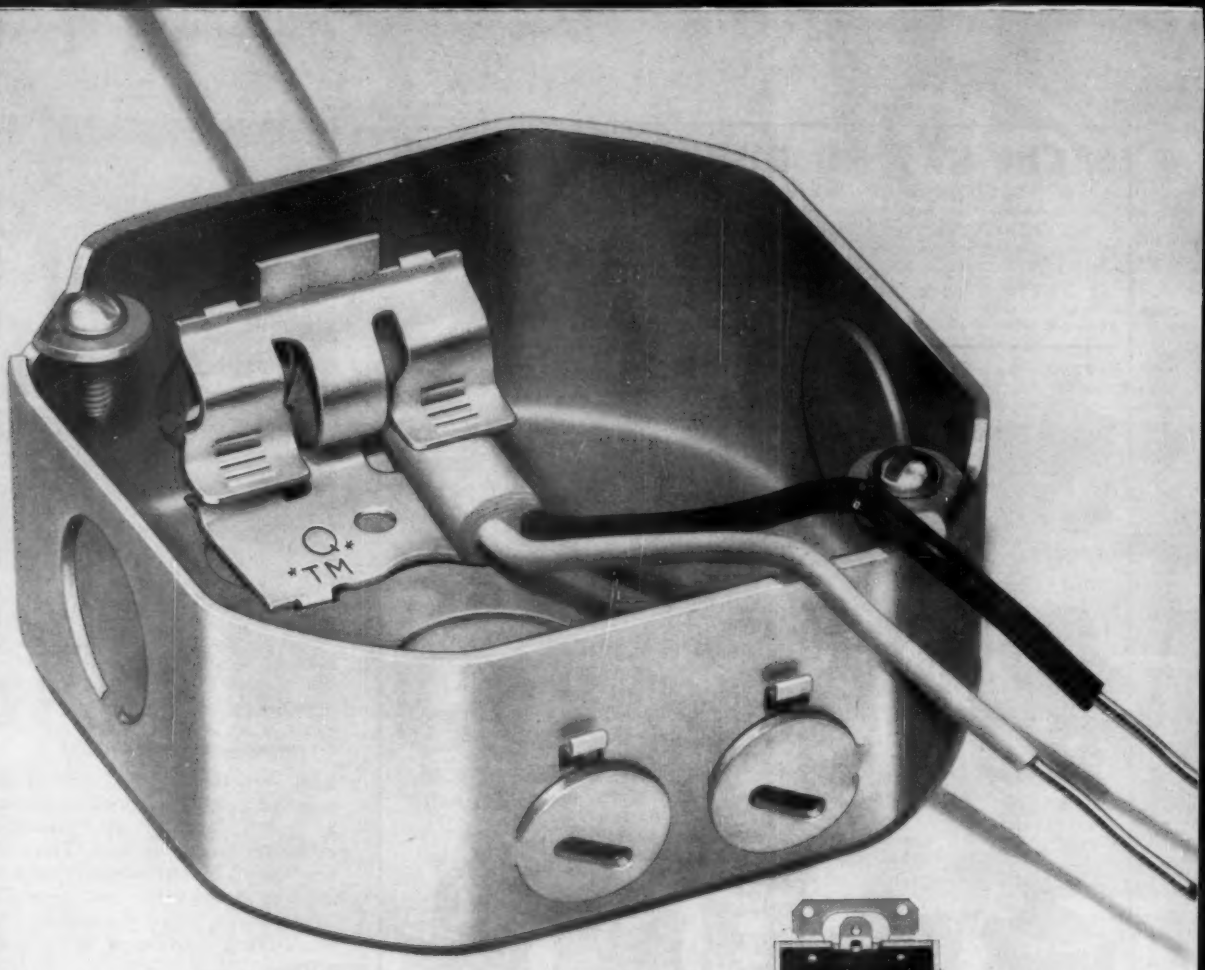
Atlas Missile Plant Has Multi-Feature Storage Center

METHOD

Convair's astronautic plant on Kearny Mesa near San Diego, Calif., is a restricted-access center producing the Atlas. And, to produce this fabulous missile, it is necessary to stock over 22,000 items that range from intricate electronic components to simple nuts and bolts. These items are obtained from over 1200 different manufacturers in 32 states and, not including many classified items furnished directly by governmental agencies, this huge parts inventory is valued at over $11-million.

These OSP (outside procured stores) items require more than 30,000 sq ft of storage shelf space. And, to properly inventory, protect and collect these parts as required, 66 employees work on a 2-shift schedule.

This storage center is unique for several reasons. For example, it is completely free-standing and self-contained, presently forming a 3-



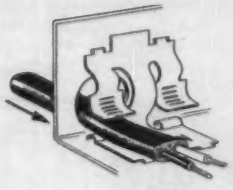
New RACO "Q"* Quick-Clamp can save hours on the job

With RACO's New "Q" Quick-Clamp you can install non-metallic sheathed cable in seconds. Simply push the cable through "Q" Quick-Clamp. Cable is held firmly in place, can't be pulled out until clamp is released. To release the cable, apply a little pressure under the clamp with your screwdriver. With the new "Q" Quick-Clamp there will be no more lost time tightening and loosening cable clamp screws . . . no more stripped screw threads.

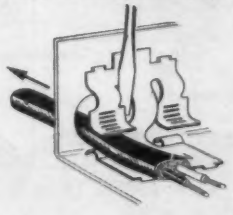
And . . . you'll save an hour or more on the average job (60 to 100 boxes per house). Your RACO Distributor has the New "Q" Quick-Clamp Switch and Outlet Boxes. They're revolutionary, yet so simple to operate. (Exceed Underwriter Laboratories' tests; are fully protected by patents.) See them and try them now.

*Trademark

"Q" Quick-Clamp available in RACO switch or outlet boxes



Cable moves freely into clamp and is gripped tightly



To back-off cable, release clamp pressure with screwdriver

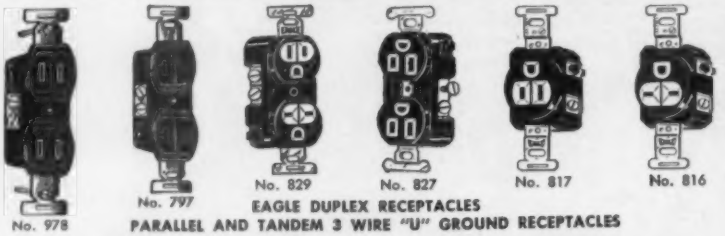
ALL-STEEL EQUIPMENT INC. Aurora, Illinois

EAGLE HAS NO DOUBLE STANDARD

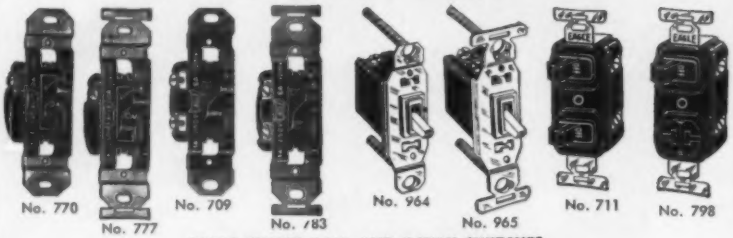
★ NO SECONDARY LINE ★ ONLY ONE QUALITY—THE BEST

UL APPROVED	SPECIFICATION GRADE	POPULARLY PRICED

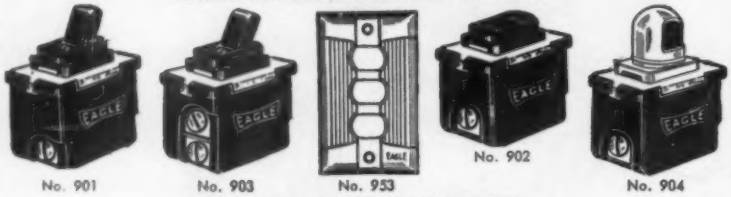
SPECIFY USE — EAGLE — APPROVED AND PROVED WIRING DEVICES



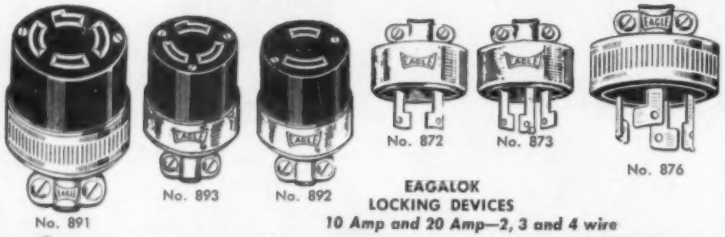
EAGLE DUPLEX RECEPTACLES
PARALLEL AND TANDEM 3 WIRE "U" GROUND RECEPTACLES



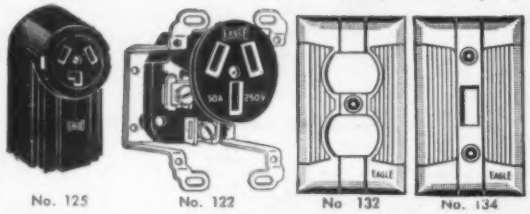
EAGLE SINGLE POLE AND 3-WAY SWITCHES
GENERAL PURPOSE AND SPECIFICATION GRADES



EAGLE INTERCHANGE WIRING DEVICES
INTERCHANGEABLE WITH ALL STANDARD LINES



EAGALOK
LOCKING DEVICES
10 Amp and 20 Amp—2, 3 and 4 wire



RANGE AND DRYER RECEPTACLES — EAGALINE WALL PLATES

SEE THE COMPLETE EAGLE DISPLAY AT YOUR WHOLESALER

Write to Eagle for Contractor's FREE POCKET CATALOG

"PERFECTION IS NOT AN ACCIDENT"

EAGLE ELECTRIC MFG. CO., INC.

LONG ISLAND CITY 1, NEW YORK

MOVABLE LIGHTING UNITS slide along trolley ducts, thereby providing concentrated illumination where it is needed. Fixtures are within easy reach of workers and movement of units may be achieved with a slight push. Average vertical illumination on faces of stacked containers is approximately 30 footcandles.

level structure erected within the plant proper, yet planned to support a fourth level if that becomes necessary at a later date. The storage "core" is conveniently centered between fabrication and assembly departments, thereby speeding and simplifying delivery of parts to all areas.

The core is an all-steel fireproof assembly composed of storage bins positioned in long open-end rows, stacked one atop another with shelves adjusted to accommodate various size containers. Although there are no additional supporting columns or external means of bracing, cross-beams, expanded-metal decks (permitting free circulation of air) and railings across the open ends of the aisles connect adjacent sections and provide structural stability for the structure.

Electrically, this storage core is of interest because the 26 aisles are illuminated by movable All-Brite 2-lamp plasti-enclosed luminaires that slide along overhead BullDog 120-volt trolley ducts. Since these fixtures are mounted within easy reach of workers on the decks, and since fixtures may be rolled along trolleys easily by a slight push, lighting may be concentrated where it is needed. This decision to provide movable concentrations of light rather than to install continuous lines of single-lamp fixtures mounted end-to-end resulted in several plus values, for the cost of the lighting installation was reduced by about 35%, and the illumination on vertical surfaces was boosted from

Tube mill operator here keeps close watch as he adjusts weld heat on control console.

Contractors find:

CIRTUBE* EMT maintains uniform high quality

KNOWING that the EMT you use is always of the same high quality—from tube to tube, bundle to bundle, and month to month—is one sure way to help guarantee better electrical jobs at lower installation costs.

CIRTUBE EMT is like that. Made in a brand new plant, with ultra modern equipment, the latest techniques, and the most stringent quality control measures that experienced engineers can devise, CIRTUBE EMT has already acquired a reputation for unsurpassed uniform quality and workability.

Uniform, high quality is only one of many reasons why CIRTUBE EMT helps get better, more profitable wiring jobs.

Why don't *you* try CIRTUBE EMT on your next job — you'll like working with it. Now at your Circle wholesaler's.

*Trade Mark

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

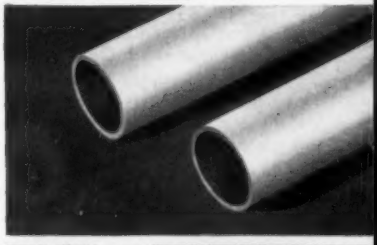
CIRTUBE EMT *Ask for it!*

Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

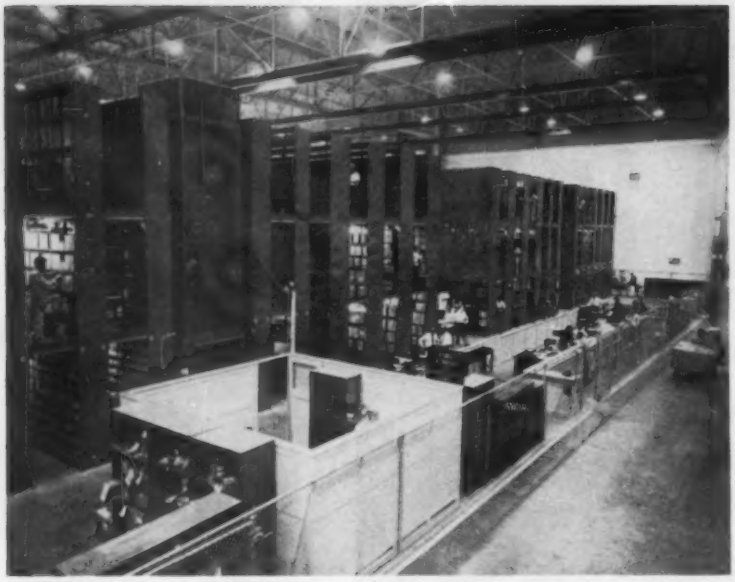
Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.

Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.



Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.



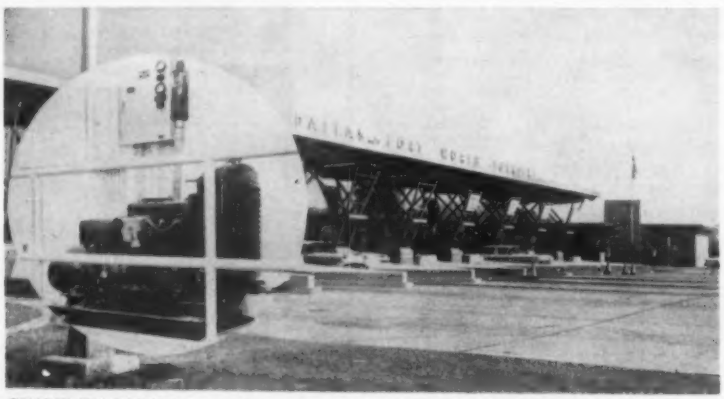
STORAGE CORE is self-contained free-standing 3-level structural assembly with strength and clearance to permit addition of fourth tier if needed. Parts may be moved up or down by cage-enclosed elevators or by inclined belt conveyors. Expanded metal decks supported by cross-beams stabilize this otherwise-unbraced structure.

an estimated 18-fc average to an actually obtained 30-fc level. This system was installed by Fischbach & Moore's San Diego branch.

Stock items may be raised or lowered between the main floor and the elevated storage decks either by inclined conveyor belts or by cage-enclosed elevators having drive motors located atop the enclosures. Stairways are likewise provided as an extra means of access between stock tiers.

Parts and supplies are catalogued on perpetual inventory cards as they are placed on shelves or withdrawn for use, thereby keeping residual accounts constantly accurate. Storage containers are identified and located by a letter-number system, while descriptive labels on containers further identify contents. Parts are issued to production personnel when called for at withdrawal counters.

Due to the scope and importance of these stocked items, records must be kept with a high degree of accuracy. And, due to the several unique methods combined here for purposes of handling, storing and lighting, this self-contained parts center offers several useful ideas that other plants may apply.



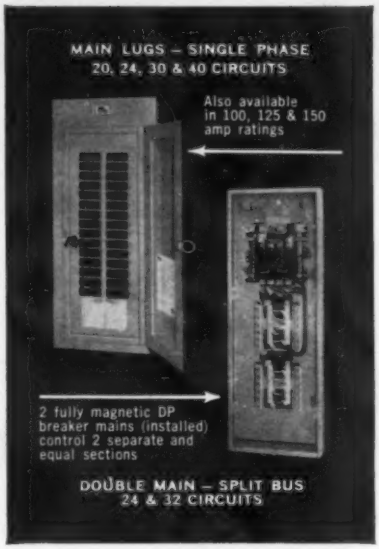
STAND-BY POWER from an engine generator assures the smooth and continuous operation of the Dallas-Fort Worth Turnpike which joins two of the principal cities in Texas. Each of the six toll plazas on the Turnpike is equipped with a 10-kw Kohler electric plant. The plants provide emergency power for floodlighting at toll plazas, emergency inside lights and operation of electric ticket machines. At one toll plaza, a Kohler electric plant provided emergency power for 18 hours during central power failure.

(Advertisement)

NEW PRODUCT NEWS

New 200 Amp "MP" Load Centers

20 to 40 Circuits


MAIN LUGS – SINGLE PHASE
20, 24, 30 & 40 CIRCUITS
Also available in 100, 125 & 150 amp ratings
2 fully magnetic DP breaker mains (installed) control 2 separate and equal sections
DOUBLE MAIN – SPLIT BUS
24 & 32 CIRCUITS

Today's modern electrical living means increasingly more 200 ampere installations.

To help meet this need, Murray now introduces these new 200 amp "MP" load centers – further rounding out its broad line of boxes for residential installation.

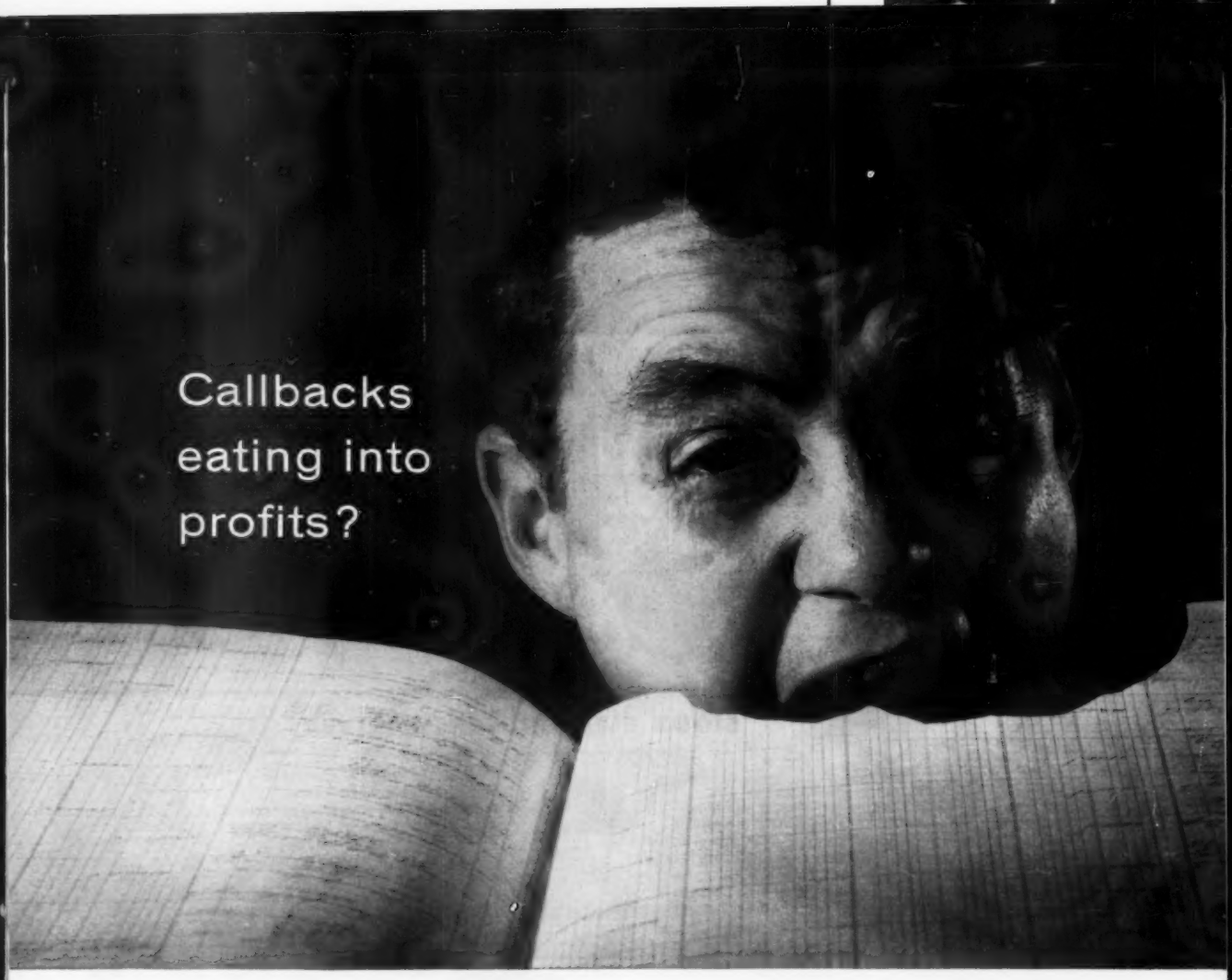
Load centers contain U.L.-approved connectors for copper and aluminum conductors, neutrals on top near main lugs, adjustments for flush mounting.

Doors are available on all models and provision made for locks. Shallow box construction helps make neat installations.

Make sure you use "MP" *fully magnetic* circuit breakers with these new boxes – best protection for you and your customers.

"MP" breakers and 200 amp load centers are at your Murray wholesaler's. Ask for them. Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn, N. Y.

NEW MURRAY CATALOG "60" READY NOW
– SEND FOR YOUR COPY



. . . starve 'em out with Murray "MP" breakers, fully magnetic—no thermal element!

No contractor likes to make callbacks—they take time, cost money, lose customers. So why take a chance on breakers that don't quite fill the bill—when you can use *fully* magnetic "MP" breakers at no extra cost!

"MP" breakers are designed to work strictly on current, not heat. Advantages to contractors: no thermal element, no danger of overheating, no derating, no installation problems.

Jobs go up faster, better—*stay* profitable!

No Other Quality Breaker Can Match These Features!

"MP" breakers give you *fully* magnetic protection *at all degrees of overload*—not just flash shorts. And, since they're unaffected by heat, they can be installed wherever it's most convenient.

More! "MP" breakers have tungsten silver contacts, built-in time delay to avoid nuisance tripping, immediate resetting – and many other features.

Plus Full Selection Of Boxes To Fit Any Job!

Main lugs and main breaker disconnect, single and three phase, split bus—2 to 42 circuits. Boxes contain neutrals on top, plaster line adjustments, U. L.-approved connectors for copper or aluminum conductors, shallow box construction, sequence bussing—everything you need to make fast, neat installations.

Next time you order, ask for "MP" breakers and load centers. Many other satisfied contractors do. Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn 16, New York.

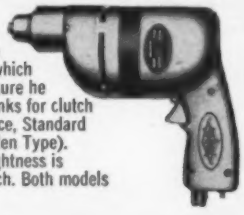
FULLY MAGNETIC "MP" BREAKERS
"imitated . . . but never equalled"

60 1899 1959 TH YEAR
Murray

CERTIFIED SIOUX POWER

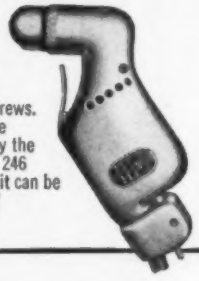
Electric Drills

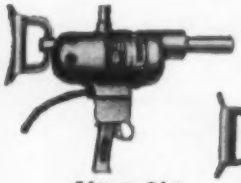
SIOUX ELECTRIC SCREWDRIVERS



NO. 260 — 262
On No. 260 Super Screwdriver the operator controls the tightness with which a screw is set by the amount of pressure he applies. The ¼" Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket head (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models equipped with reversing switch.

NO. 242
It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 246 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.



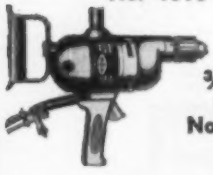


1" H.D. DRILL
No. 1579

⅝" & ¾"
H.D. DRILLS
No. 1560, 1575

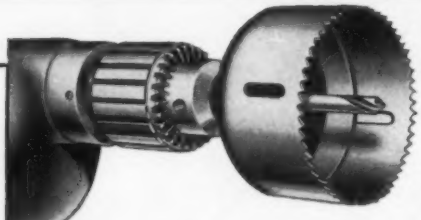
½" H.D. DRILL
No. 1550

½" STD.
DUTY DRILL
No. 1510



⅜" & 5/16"
H.D. DRILL
No. 1517, 1519

½" SLOW SPEED
DRILL No. 1548



SIOUX HIGH-SPEED STEEL TEETH HOLE SAWS

will cut holes from ⅝" to 6" in diameter, in any free machining material to a depth of 1¼". Alloy or stainless steel may be cut at slow speed. High-Speed teeth welded to chrome-vanadium body give maximum life and cutting ability.

POWER* SPECIFICATIONS SIOUX ELECTRIC DRILLS

When it's a SIOUX you know what it will do

Catalog Number	No Load Speed	H.P. and R.P.M. at Load Speed		Oz. Ft. Torque at Load Speed	H.P. and R.P.M. at Peak Load Speed		Oz. Ft. Torque Peak Load
1475	2250	5/64	1525	4.9	7/64	1050	8.8
1480	1600	7/64	1140	7.9	5/32	790	16.8
1485	1650	3/32	1060	6.9	1/8	620	16.7
1495	1650	3/32	1060	6.9	1/8	620	16.7
1498	400	3/16	275	45.0	9/32	215	108.0
1510	525	27/64	370	95.0	39/64	230	222.0
1517	925	13/32	670	49.0	9/16	540	135.0
1519	1250	13/32	860	37.5	9/16	500	96.0
1525	1650	5/16	1060	31.0	3/8	680	45.0
1541	925	13/32	670	49.0	9/16	540	85.0
1548	525	27/64	370	95.0	39/64	230	222.0
1550	525	7/16	325	108.0	17/32	175	252.0
1560	400	9/16	260	175.0	3/4	155	400.0
1575	400	3/4	205	308.0	1-1/8	125	748.0
1579	350	49/64	200	315.0	1-9/64	115	800.0
1472	1600	13/64	960	17.8	17/64	720	32.4
1473	950	13/64	575	31.6	17/64	430	55.0
1474	625	13/64	375	44.6	17/64	280	84.2
1477	950	13/64	575	31.6	17/64	430	55.0
1478	625	13/64	375	44.6	17/64	280	84.2
1479	1600	13/64	960	17.8	17/64	720	32.4

*for complete specifications

SEE THE NEW SIOUX CATALOG

when it's a SIOUX

You know what it will do!

The Horsepower and torque for each SIOUX drill is rated, stated, and certified. It isn't necessary to buy just a drill. When it's a SIOUX you know what it will do. See the power specifications for SIOUX Electric Drills in this advertisement.

NEW *Super Powered* **¼" and ⅜" DRILLS!**

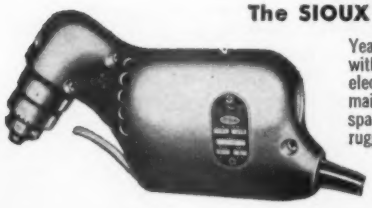
Here is super power to provide all the torque necessary for any operation where this type of drill would normally be used. (See specifications) And there's a speed for every need. It's an entirely new design in which the brushes have been located at the fan position at front of the drill. The advantages include cooler running, and easier inspection and replacement of motor brushes without partial or complete disassembly of the tool. Ball and roller bearing construction, with finest precision gears and mechanical design have achieved a new high in output efficiency.

¼" No. 1472, 1473,1474

⅜" No. 1477, 1478, 1479

All time sales champ

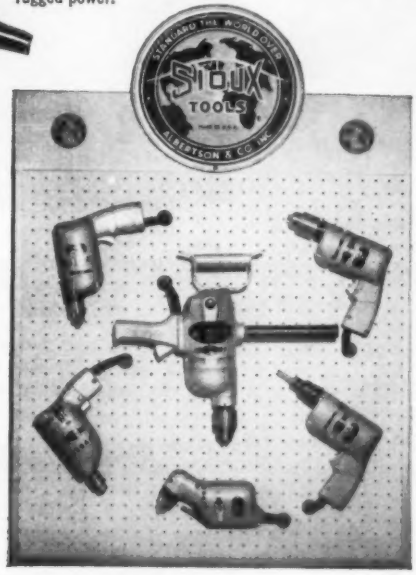
The SIOUX No. 1495 ¼" ALL ANGLE DRILL



Year after year this is a top seller in the SIOUX line. It's popular with almost everyone—auto mechanic, sheet metal worker, electrician, shipbuilder, woodworker, assembly line, factory maintenance man. It fits the hand and operates in restricted space like no other tool. It's a most convenient handful of rugged power.

Leading distributors everywhere display and sell Certified **SIOUX** *power drills.*

AUTHORIZED SERVICE AND DISTRIBUTORS IN PRINCIPAL CITIES



⅜" H.D. DRILL No. 1541

¼" H.D. DRILL No. 1525 BALL BEARING

¼" H.D. DRILL No. 1480 SEMI BALL BEARING

½" LT. DUTY DRILL No. 1498

¼" DRILL No. 1485

¼" DRILL No. 1475

ALBERTSON & CO., INC.

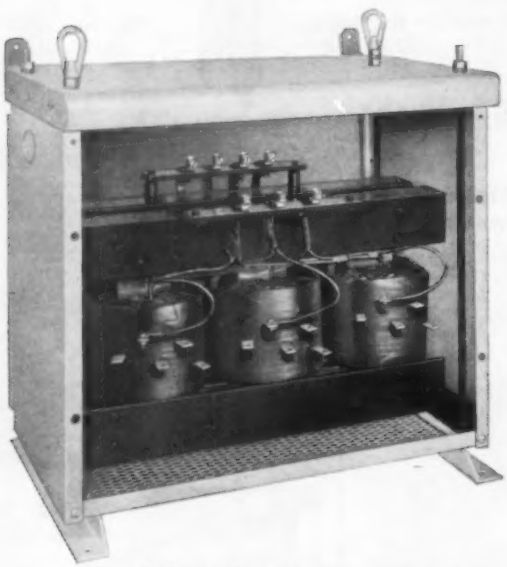
SIOUX CITY, IOWA, U. S. A.

AIR IMPACT WRENCHES • AIR SCREWDRIVERS • "PELICAN" NUT ACCUMULATORS • ELECTRIC IMPACT WRENCHES • DRILLS • GRINDERS • SANDERS • POLISHERS • VALVE FACE GRINDING MACHINES • SCREWDRIVERS • PORTABLE SAWS • FLEXIBLE SHAFTS • ABRASIVE DISCS

14/9	1600	13/64	960	17.8	17/64	720	32.4

When you select dry-type transformers initial costs can be false economy

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS



45 Kva 3-phase transformer with taps. Interchangeable wall or floor mounting. Front panel removed, shewing interier.

●

COMPLETE LINE FOR EVERY PURPOSE up to 10,000 Kva, up to 15,000 volts, including special transformers and saturable reactors.

The same quiet SORGEL transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any electrical manufacturer.

The first cost of dry-type transformers is not always the final cost. Don't be misled; the lure of lower prices often camouflages operating and installation costs. SORGEL SOUND-RATED DRY-TYPE TRANSFORMERS are designed and constructed for long life. They provide the absolute ultimate in operating efficiency, ease of installation, overload capacity and long-range economy.

SORGEL offers these proven advantages

LOWER COPPER LOSS — Coils are liberally designed for the most effective use of the latest developments in insulating materials, have large air ducts for low hot spot temperature and are vacuum-impregnated to provide a co-ordinated insulation system.

LOWER CORE LOSS — Cores are designed with the industry's lowest magnetic flux densities, resulting in low core loss and the lowest sound level. The entire unit is secured within a substantial frame. Large units are mounted on vibration dampers to minimize vibration transmission to adjacent areas.

QUICKER AND EASIER INSTALLATION — The enclosure is self-supporting and entrance can be made on sides, top, bottom or back. Connecting is made easier by means of solderless connectors on terminal blocks in roomy connection compartments. Units up to 75 Kva single phase and 45 Kva 3-phase, are furnished for interchangeable wall or floor mounting.

Over 43 years experience in the development, manufacturing and application of transformers, has made these achievements possible.

You will be doing your company or customer a great service when you select the best dry-type transformer made only by . . .

Sorgel Electric Company

836 W. National Avenue, Milwaukee 4, Wisconsin

Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.

FACE GRINDING MACHINES • SCREWDRIVERS • PORTABLE SAWS • FLEXIBLE SHAFTS
• ABRASIVE DISCS

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CATALOGS, BULLETINS
ADVERTISEMENTS

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  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

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  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

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330 West 42nd St.,
New York 36, N. Y.

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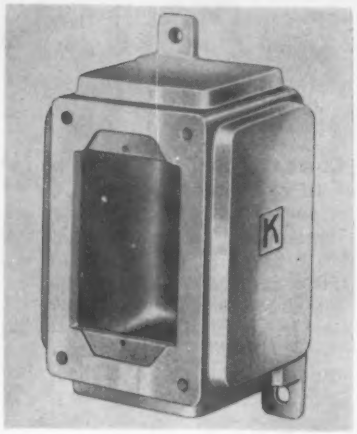
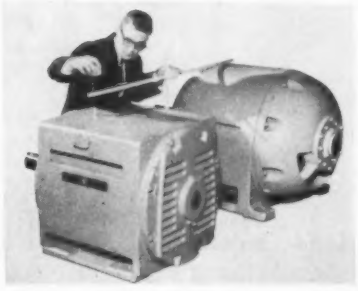
Product News



Junction Box **(1)**

A universal junction box to accommodate various types of switches, pushbutton stations, pilot lights, etc. has been added to this line. Constructed of aluminum alloy and designed for plenty of wiring room, the series "US" and "UD" is provided with hub blanks that can be drilled and tapped for ½, ¾ and 1 in. conduit. The boxes are designed for Class I, Group C & D; Class II, E, F & G.

Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, *Mo.*



Random-Wound Motors **(2)**

Industry's first line of random-wound motors with a sealed, silicone compound insulation system has been announced. Development of the new Polyseal winding protection will extend the areas of application for open motors. Motor windings are so completely sealed by the new system that dripproof motors with Polyseal silicone insulation systems may now be used on many applications in wet or corrosive areas. Application of the liquid silicone results in a thin, waterproof coating that bonds tightly but still allows good heat transfer from the end turns to the ventilating air. The insulation is flexible. Motors with the new insulation will be equipped with three additional protective features designed to neutralize the effects of moisture and corrosion.

General Electric Co., Schenectady 5, *N. Y.*

Instrument **(3)**

A new Type PB tong test ammeter, primarily designed for measuring small amounts of direct current, in one-half ampere divisions, from 0 to 10 amps. In addition, it can be used to read both ac and dc up to 20 amps. Measurements are taken by clamping the tongs around the electrical conductor, without breaking the circuit or insulation. Jaws can accommodate conductors up to ½ in. dia. Two ranges are provided on one dial, 100-10 amps for dc only and 0-20 amps for both ac and dc.

Columbia Electric Mfg. Co., 4519 *Hamilton Ave., Cleveland* 14, *Ohio*

Support Systems **(4)**

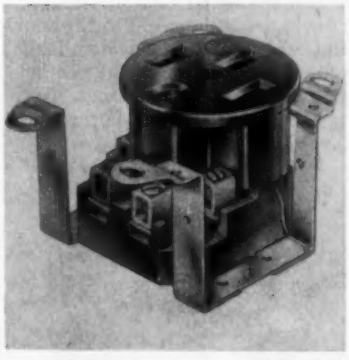
A new control and power cable support system has been developed. The 2SB series features a 9-11 gauge expanded mesh bottom, that may be fabricated to any width necessary, to support any number of cables desired. Light weight mesh construction; increased ventilation properties, of the mesh bottom, result in higher ampere ratings for the cables and reduces electrical losses, throughout the cable support system. It is available in either aluminum or steel. Literature is available.

The Chalfant Products Company, Inc., 11525 *Madison Ave., Cleveland* 2, *Ohio.*

Oven Hood **(5)**

A new pre-wired ventilating range hood for built-in ovens. Designed to provide an outlet for heat and odors, the hood also serves to protect cabinets from grease, smoke and scratches. It features an exhaust blower, removable filter that protects blower and a single speed pushbutton switch. Available in 24-, 26-, and 32-in. lengths in stainless steel.

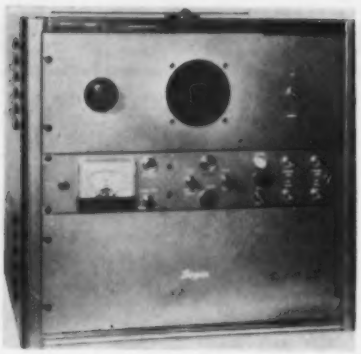
Berns Air King Corp., 3050 *N. Rockwell St., Chicago* 18, *Ill.*



Receptacles **(6)**

A new line of 30- and 50-amp, 250-volt heavy-duty grounding receptacles, designed primarily for heavy duty applications in homes, offices and plants. Of bakelite construction, these receptacles are suitable for use with electrical portable tools and welding and maintenance equipment in industrial applications; heavy business machines in offices; and ranges, dryers, freezers, and other residential appliances. Both 30- and 50-amp, 250-volt receptacles fit galvanized boxes, available with surface box cover, also, brushed brass and stainless steel plates for flush installations, 4⅛-in. square and not less than 2½ ins. deep, and are available with 4-wire rubber cord sets in 3-, 4- and 6-ft lengths. Listed as standard by UL.

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



Vandal Alarm System (7)

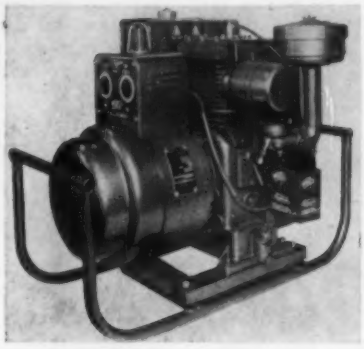
A complete, centralized sound surveillance system is available for detecting the presence of intruders, without warning to them, in any one of a group of closed buildings. Used primarily to protect school systems against vandalism, the alarm system transmits an audible and visual signal to a central supervision station (police headquarters, for instance) whenever the noise level in a building exceeds the normal quiet level. The system designates the particular building and provides for listening to the sounds in the building. The system is made of packaged equipment, complete with listening microphones. Wiring to the central station is made with leased 600-ohm lines.

Bogen-Presto, P. O. Box 500, *Paramus, N. J.*

Transformers (8)

Voltage ratings of dry-type general purpose transformers, Type EP and EPT, have been extended to the 5-kv class. The higher voltages are available on single-phase units, 10 kva and below, and 3-phase units, 15 kva and below. These transformers, either in the 600- or 5000-volt class are particularly suited for applications such as serving lighting loads from power circuits or to step down voltages for appliances, fans, portable tools, pumps, compressors, machine tools, and rectifiers. All units have brackets for wall mounting and are suitable for either indoor or outdoor installation.

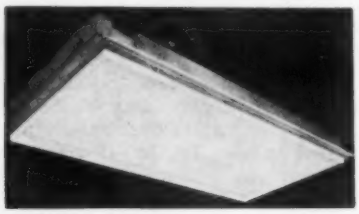
Westinghouse Electric Corp., Box 2099, *Pittsburgh* 30, *Pa.*



Generator (9)

A new 3-wire type generator, called "Full Power," offers full power at either 115 volts or 230 volts from one outlet. This feature enables a single unit to serve dual voltage purpose at full power and is available on the 2500-watt and 3500-watt generators. Generators are available with a carrying cradle, stationary base, or 2-wheel dolly.

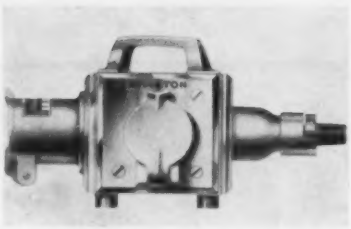
Wincharger Corp., Sioux City, Iowa.



Lighting Unit (10)

A new recessed Holoflux Series No. 6400 with a streamlined design integrates with a wide variety of contemporary interiors: stores, offices, showrooms, banks, public buildings, institutions, public areas. They are available in two styles. One employs a "Prism-Border," a new lighting concept of a lens with a shallow dropped edge that projects light on the ceiling. The other features a flat Controlens for unbroken ceiling surfaces. They are designed for all types of ceilings. Units allow for installation of continuous runs. The basic 4-ft unit consists of two 2 by 2 injection molded crystal acrylic plastic Controlens.

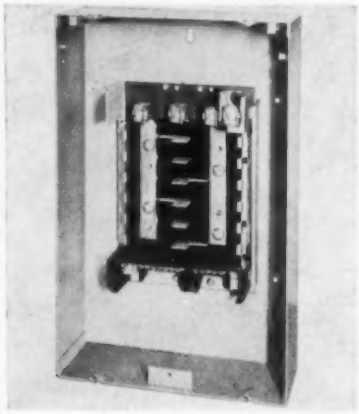
Holophane Company, Inc., 342 *Madison Ave., New York* 17, *N. Y.*



Current Tap (11)

In locations under Class I, Groups C and D with hazardous areas, a single, portable current tap can operate three separate sets of electrical apparatus at the same time. Although primarily designed for use in hospital operating rooms, Type "CPSCT" current tap can be used in industry. Tap has three branch receptacles, each employing the dead-end principle to isolate exposed contacts from live inner contacts for positive explosion-proof protection. The three pole receptacles in the current tap will take standard Appleton Type "CPP" Form I plugs as used in the "CPS" wall receptacle series.

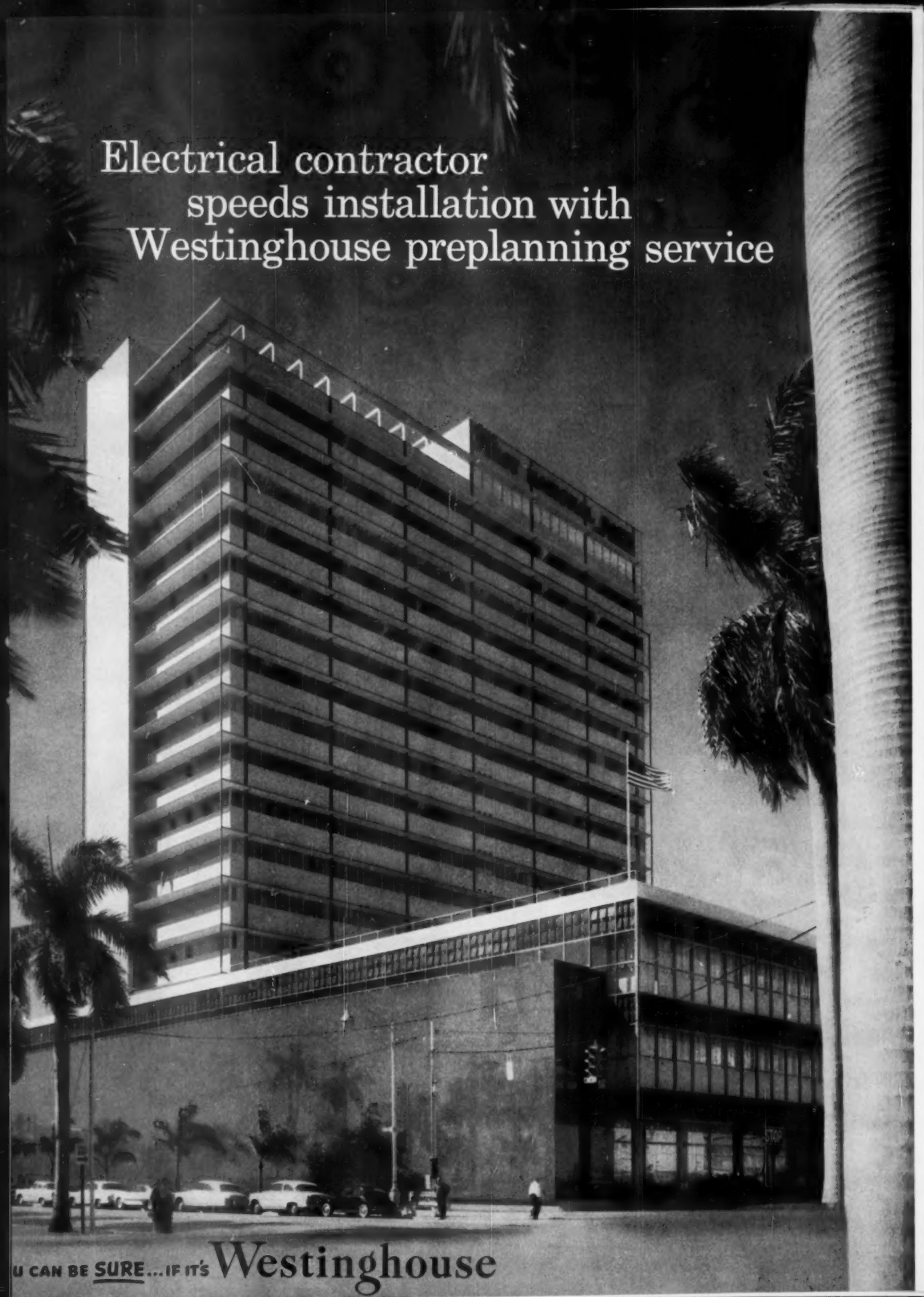
Appleton Electric Co., 1701 *Wellington Ave., Chicago* 13, *Ill.*



Load Centers (12)

A new line of 3-phase "MP" load centers for 100- and 200-amp installations. Boxes contain from 12 to 42 circuits; will accommodate any combination of 1-, 2- or 3-pole breakers. They have UL-approved connectors for copper and aluminum conductors. Other features include neutrals or neutral main lug on top, plaster line adjustments, shallow box construction, generous wiring room. They are rated for all 3-phase jobs: 4-wire—120/208-volt ac and 120/240-volt ac; 3-wire—240-volt ac.

Murray Manufacturing Corp., 1250 *Atlantic Ave., Brooklyn* 16, *N. Y.*


Electrical contractor
speeds installation with
Westinghouse preplanning service
U CAN BE SURE... IF IT'S Westinghouse

COVER PHOTO: Newest face on the downtown Miami skyline is the 18-story First National Bank Building, headquarters for Florida's largest and Miami's oldest bank. The first three floors are bank offices and facilities and 13 of the 15 floors in tower are rental area.

Proof and Transit Department of bank can clear over 8 million checks, drafts and money orders per month. This operation, which includes 31 electric sorting machines going day and night, demands dependable, uninterrupted electrical service.

Edward Clarke, Project Manager for Rooney-Turner, General Contractors: H. E. Magann, WESCO Manager; and George J. Meinch, Vice President of L. K. Comstock Co., Inc., Electrical Contractors, review blueprints of new bank and commercial office building. Working together on this job, they found that they were able to keep well within the allotted time schedules.

No delay in The First National Bank of Miami job— because contractor, distributor and Westinghouse preplanned the installation

The First National Bank of Miami recently opened for business in the third new building they have occupied in their 56-year history. As before, this move was made necessary because of increased business and growth of their services.

Westinghouse equipment, used in all parts of the building, assures complete and adequate electrical service for highly electrified banking operation and the tenants throughout the building.

The owner, the architect-engineer and the contractor considered construction scheduling as a profit-or-loss factor. They all welcomed the opportunity to work with the Westinghouse distributor and product specialist in careful preplanning of all phases of the electrical installation. Electrical need now and for the future was carefully considered.

Westinghouse products were selected and specified because of system adaptability, quality and ease of installation. The electrical installation went off without a hitch and was completed within the schedule made necessary by other construction, because the electrical contractor and the Westinghouse distributor were able to preplan and schedule deliveries.

The heart of the building's electrical system is a Westinghouse building-type switchboard which protects the circuits distributed at 277/480 volts. Three parallel runs of Westinghouse bus duct serve as main feeders in a vertical-rise design. On each floor, electrical closets house Westinghouse dry-type transformers—for step-down to 120/208 volts—and distribution through Westinghouse panelboards. *(continued)*

YOU CAN BE SURE...IF IT'S

Westinghouse

Over 250 Pages Westinghouse Data in Sweet's Construction File.

George Meinch shows H. E. Magann and Edward Clarke Westinghouse lighting panelboards concealed behind hinged wall in ultramodern bank cafeteria. Panelboard on left is Type NLAB, 120/208-volt, 3-phase, 4-wire unit; other is Type NH1B, 277/480-volt.

Charles W. Butsch, Westinghouse product specialist, points out Westinghouse bus duct advantages to prospective tenant. Low-impedance bus duct connects incoming power to Westinghouse switchboard. Space-saving Westinghouse DT-3, 45-kva, dry-type transformer (foreground) is rated at 480-120/208 volts. Main disconnect safety switches are Type CAF, 100- and 200-amp.

continued . . . Electrical contractor—
Westinghouse speed installation

Successful contractors have found that selection of all-Westinghouse equipment, plus localized service, greatly increases installation efficiency. Westinghouse can help with any phase of your electrical planning and construction. Ask the Westinghouse distribution outlet near you, or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-94121

OWNER: The First National Bank of Miami, Miami, Fla.
ARCHITECT-ENGINEER: Weed-Johnson Assoc., Miami, Fla.
CONSULTING ENGINEER: Norman J. Dignum & Assoc., Miami, Fla.
GENERAL CONTRACTOR: Rooney-Turner (Frank J. Rooney, Inc., Miami, Fla., and Turner Construction Co., New York, N. Y.)
ELECTRICAL CONTRACTOR: L. K. Comstock Co., Inc., Miami, Fla.
WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co., Miami, Fla.

Over 250 Pages Westinghouse Data in Sweet's Construction File.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

William Bausch, Bank's Electrical Supervisor, operates Westinghouse Type NLAB panelboard distributing 120/208 volts throughout the floor. Three vertical runs of 600-amp Life-Line® busway provide 277/480 volts to each electrical closet. Lightweight, wall-mounted dry-type transformers step down distribution voltage from plug-in circuit breaker protective devices to 120/208 volts.

George Meinch, center, explains to Charles C. Gaines, bank staff member (left), and Edward Clarke the dead-front construction of the Westinghouse building-type switchboard which assures complete safety of operation. Note blank sections allowed for future growth.

New Miami bank building gets

13 floors of full power with Westinghouse bus duct

NO APPRECIABLE POWER LOSSES
FROM FLOOR TO FLOOR—CONVENIENT
PLUG-INS MAKE EVERY FLOOR A POWER STATION

"Power closets" on 13 floors of the new First National Bank Building give each floor *full electrical power*—with no appreciable power loss even on the topmost level.

Convenient power-taps make every floor a power station. No splicing or cutting—just plug into the busway—take off full power.

The Westinghouse busway run in this new building is over 550 vertical feet—supplies all of the lighting power demands of the building, plus numerous business machines. These three vertical rises are 600-amp, 277/480-volt, 3-phase, 4-wire.

For the complete story on Westinghouse bus duct for commercial or industrial buildings (low-impedance, plug-in and Life-Line®), contact your nearby Westinghouse sales office. Or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30293

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

START-STOP STATION with pilot. For surface mounting.
SELECTOR SWITCH with pilot. Brass plate for flush mounting.
SIZE 0 MAGNETIC STARTER with selector switch in cover.
SIZE 0 COMBINATION STARTER with fusible disconnect and local control.
MANUAL STARTER with pilot. For surface mounting.
MANUAL STARTER and selector switch. For surface mounting.

You'll build bigger HEATING & VENTILATING PROFITS with these controls because . . .

. . . **THEY'RE EASIER TO INSTALL AND MAINTAIN,** helping to make your work more profitable. And their added performance and dependability help build your business by insuring more satisfied customers.

. . . **THIS IS THE ONLY *COMPLETE* LINE** of motor controls and pilot devices for *all* heating and ventilating applications including: fans, blowers, unit heaters and ventilators, compressors and pumps.

. . . **ONLY ARROW-HART** offers you a line that includes far smaller, lighter Type "RA" Magnetic Controls that save valuable space and help you reduce installation time and costs.

Act *now* to make your next job more profitable. Send today for your free 16-page booklet completely describing how to wire Arrow-Hart Motor Controls.

Write to The Arrow-Hart & Hegeman Electric Company, Dept. ECM, 103 Hawthorn Street, Hartford 6, Connecticut.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

ARROW AH HART

Boom and Platform (13)

A new and improved hydraulically-operated telescoping boom and aerial platform, called the Industrial Monkey. Standard Model "V" reaches 40 ft 9 ins., giving an average working height of 48 ft. Designed to be mounted on 16,000-lb or heavier truck chassis. All movements are actuated by double-acting hydraulic cylinders, and the work platform is automatically kept level by a double-acting cylinder at its base. Unit is completely maneuverable, ranging from straight-out to straight-up and has a 270° turning radius.

IM Division, Peters Company, Portland, Ore.

Tool (14)

A new combination tool, called the Scru-Drill, is equipped with a positive-clutch screw-driving mechanism and features a locking collar that permits operator to convert to direct drive for general-purpose drilling. Unit is powered by a Universal motor for 115 volts, ac or dc and includes a 3-jaw geared chuck and key, and screw driving bit and finder assembly as standard equipment. Used as a drill, the unit is capable of drilling holes up to ⅜ in. diameter in steel. It can also be used to drive hole saws, masonry bits and wood augers.

Black & Decker Mfg. Co., Towson 4, Md.

Hydraulic Pump (15)

Model P-550 "Two-Speed" hydraulic pump is designed for fast operation of all types of hydraulic tools used in the electrical, construction and industrial production trades. The 2-speed feature provides oil delivery of 115 cu in. per minute at pressures up to 150 psi during cylinder plunger approach;

and, under load, automatically switches to 57 cu in. per minute oil delivery at high pressure, 10,000 psi. Power for the axial piston pump in the unit is supplied by a 1 hp 3450 rpm repulsion motor available for all standard commercial voltages.

Blackhawk Manufacturing Co., 5325 Rogers St., Milwaukee, Wis.

Motor (16)

A new Thinline motor designed for such applications as machine tools, fans, blowers and food disposers. The new design meets NEMA design "B" specifications for torques and starting current, and standard NEMA frame diameters are maintained. Thinline design allows complete flexibility in choice of mounting flanges. Each rating can be furnished with a choice of three flanges: one with NEMA type "D"-flange dimensions, and two special flanges without mounting rabbetts. Motor can be mounted in either a horizontal or vertical position. It is available in dripproof and enclosed construction from 1 to 5 hp at 1800 rpm.

General Electric Co., Schenectady 5, N. Y.

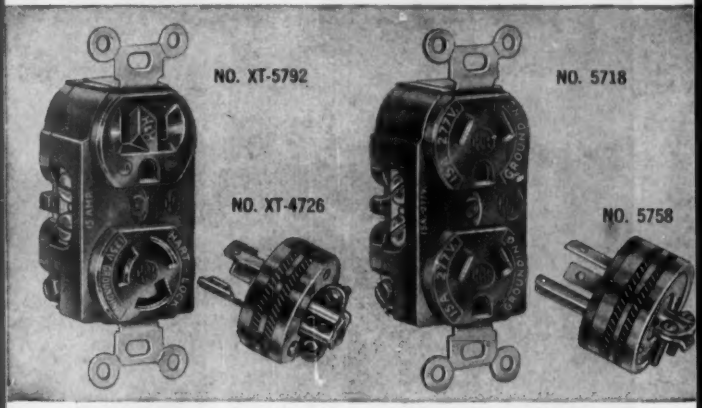
Limit Switch Arm (17)

A new adjustable limit switch arm, designed for use on conveyors, machine tools, and various types of automation equipment. Length of arm may be varied to fit any specific applications. Built for use on Square D Type T heavy duty limit switches, the new arm is made up of three pieces. Roller portion fastens to a length of ¼ in. key stock, which in turn is inserted into the section fastened to the switch. Literature is available.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

ARROW AH HART

AGAIN! From ARROW-HART NEW SAFETY FIRSTS



COMBINATION 3-WIRE GROUNDING HART-LOCK RECEPTACLES and CAPS, 15 AMPS, 125 VOLTS.

One side of this combination receptacle is 3-wire grounding Hart-Lock with 2 green hex ground screws and the other side is conventional 3-wire, 2-wire grounding 15 amps, 125 volts. Where limited space requires a duplex receptacle to provide both grounding and accidental disconnect protection and conventional U-shape grounding.

3-WIRE DUPLEX GROUNDING RECEPTACLES and CAPS—15 AMPS, 277 VOLTS.

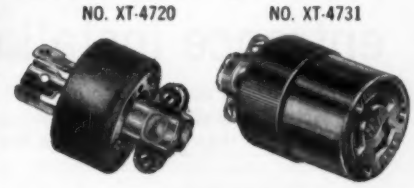
New from A-H, this line of wiring devices is specifically designed to provide new standards of safety and dependability for industrial and commercial fluorescent lighting fixtures of the disconnecting type that operate on 227 volts.

"H & H" Specification Grade

. . . AND A NEW ADDITION TO OUR LINE OF HART-LOCK DEVICES . . .

3-WIRE GROUNDING RECEPTACLES, CAPS and CORD CONNECTORS

Ideal for applications that require positive grounding *plus* locking to prevent accidental disconnect. Configuration prevents interchangeability with similar devices having different ratings. Meets latest code requirements.



These new wiring device lines offer new opportunities to build your reputation and your business by providing electrical safety and dependability for your customers. Act now to take advantage of these opportunities. Write today for complete catalog data and ordering information.

Dept. ECM, The Arrow-Hart & Hegeman Electric Co.
103 Hawthorn St., Hartford 6, Conn.

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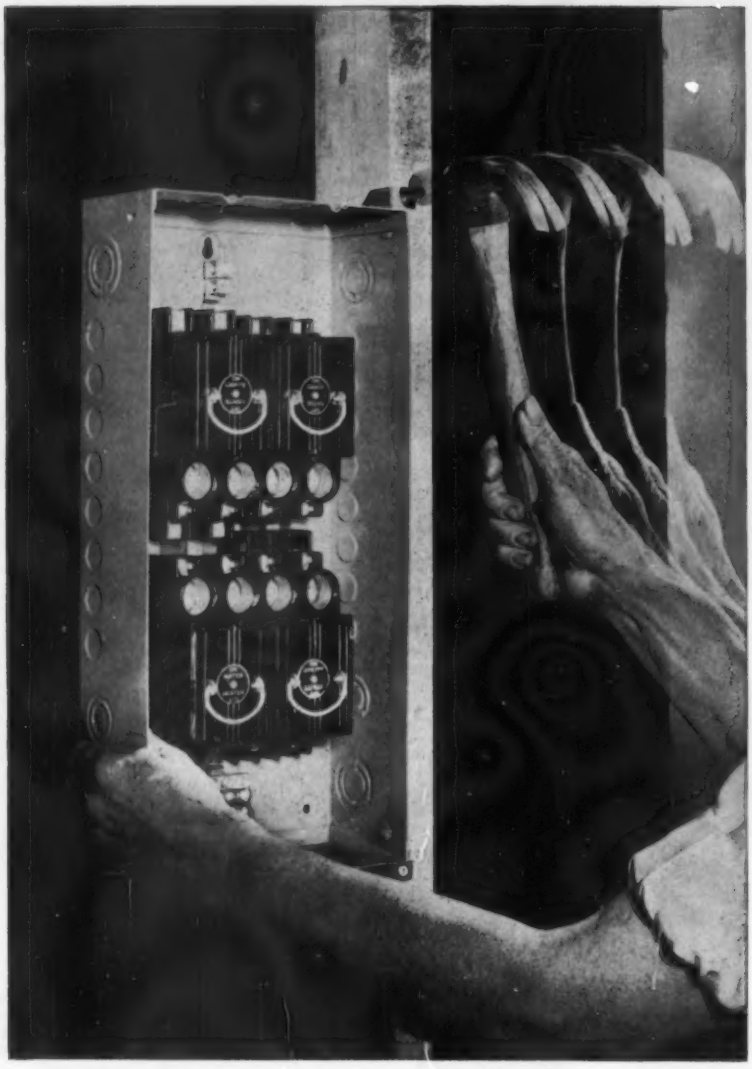
Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES



How to hammer down entrance installation costs

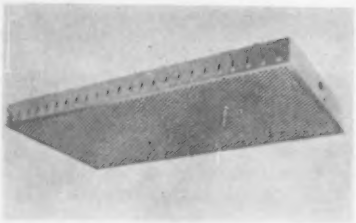
Two nails! That's all it takes to mount this Clark-American service entrance unit. Mounting brackets on the flush-type panels help reduce installation time by more than 30%—position the equipment against a stud more quickly and easily while automatically aligning its front surface to be flush with the finished plaster.

Wiring room to spare, plus more than enough knockouts on all sides, help speed up installation even further. And because Clark Controller, the standard of quality for controls in heavy industry, stands behind every piece of equipment in the complete American Electric Switch line you don't have to worry about costly, time-consuming service callbacks. Capacities range from 60 to 200 amperes. See your American Switch distributor for all the facts.

American
ELECTRIC SWITCH DIVISION

The CLARK CONTROLLER Company

Everything Under Control • 1146 East 152nd Street • Cleveland 10, Ohio



Fluorescent Fixtures (18)

An all new series of fluorescent lighting fixtures offers a unique means of decorating with colored light. Designed for general lighting use in stores, offices, schools and public buildings, the fixture, called Decor-A-Lite, is a shielded, modular type unit with slim tailored lines. It is a direct luminaire suited for surface mounting, with provision for suspension mounting if desired. The decorative lancings along the side panels emit white or colored light without distorting the color of the room lighting. Each fixture is provided with three pairs of plastic strips in green, gold and peach. When strips of selected color are dropped into place inside the housing, the lancings are softly illuminated. Unit comes in 2- by 4-ft, 2- by 2-ft, and 1- by 4-ft sizes and offers a choice of four different lay-in type bottom closures. Catalog is available.

The Miller Company, Meriden, Conn.

Lightning Arresters (19)

A new line of lightning arresters, Type IVS, from three to 121 kv for the protection of electric distribution apparatus. Arresters meet ASA, AIEE and NEMA standards. A side vent plate drops off when the pressure release diaphragm operates. For ratings from three to 97 kv, the same base mounting dimensions, three-bolt, 8¾-in. bolt circle, are provided. The 109 kv and 121 kv units have four-bolt, 10⅛-in. bolt circle.

Westinghouse Electric Corp., P. O. Box 2099, *Pittsburgh* 30, *Pa.*

Hammer (20)

A new type hammer, which absorbs much of the impact shock, has been introduced. The head of the hammer is not rigidly connected to the hammer handle but suspended from it by elastic shocks within the head housing. These shocks, or "O-Rings," are made of a resilient material having energy absorbing qualities. It is by sus-

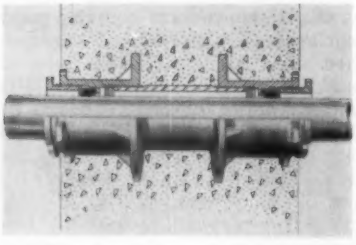
pending the hammer head that impact shock is minimized. The new hammer, called "Shure-Drive," was designed specially for use with Shure-Set, a tool which converts the energy supplied by a hammer stroke into fastening power enabling a worker to manually fasten such hard-to-penetrate materials as thin steel and concrete.

Ramset Fastening System, Olin Mathieson Chemical Corp., 12117 *Berea Rd., Cleveland* 11, *Ohio*

Automatic Entrance (21)

A newly-developed automatic entrance comes complete with a door, frame and operating mechanism designed as an integral unit. It is a completely electrical unit and the entire operating mechanism is contained within the trim 4½-in. wide transom bar above the door. Panic exit protection is built into the automatic entrance unit, since the door can be opened manually by exerting force enough to overcome the electrical power in either direction. The door automatically slows down as it nears the end of each opening and closing cycle.

Kawneer Company, Niles, Mich.



Fittings (22)

A group of five different types of wall and floor entrance fittings which provide watertight seals around conduit or cables as they pass through foundations, floors or walls of a building, are now available. Fittings are available for use with threaded or unthreaded steel conduit, fibre conduit or Transite conduit, or with exposed cables. They will accommodate conduit ranging from ¾ in. to 6 ins., or cables of varying number and sizes. Types available include Type "ESK" for conduit wall entrance seal; Type "ESC" for cable wall entrance seal; Type "FSC" for cable floor and wall entrance seal; Type "FSK" for conduit floor and wall entrance seal and Type "FST" for sealing cables entering in Transite, fibre or unthreaded steel conduit.

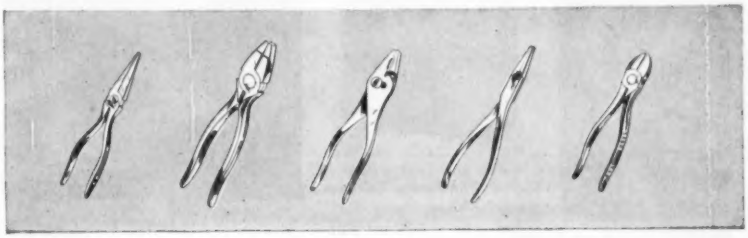
O. Z. Electrical Manufacturing Co., Inc., Brooklyn 17, *N. Y.*

Be sure
it's a genuine
CHANNELLOCK

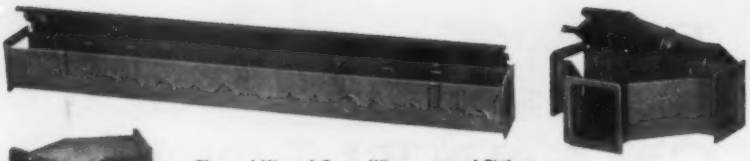
Only Channellock has this reinforced edge for greater strength.
Only Channellock has undercut interlocking non-slip channels.
LOOK FOR THIS TRADE MARK

Why? Only Channellock has undercut interlocking channels that can't slip no matter how tight you grip. Only Channellock has the reinforced tension edge to withstand maximum gripping force. These exclusive features have made the Channellock No. 420 the first choice of skilled mechanics everywhere. So be sure you get only genuine Channellock pliers. Look for the trademark on the handle.

ASK YOUR TOOL SUPPLIER FOR CHANNELLOCK PLIERS—BY NAME



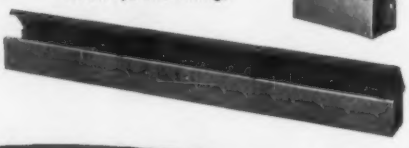
CHAMPION DeARMENT TOOL COMPANY
MEADVILLE, PENNSYLVANIA



Flanged Hinged-Cover Wireways and Fittings

Flangeless Screw-Cover Lay-in Wireways and Fittings

Flangeless Hinged-Cover Lay-in Wireways and Fittings



It pays to figure on

KEYSTONE

wiring installation equipment

You name it—Keystone has it! Here's the most complete line of quality wiring installation equipment available — anywhere! All sizes, shapes and types of U.L. listed wireways and auxiliary fittings, cabinets, boxes and enclosures—all easy to install and maintain, too. What's more, when you're faced with a special job that "standards" just can't handle—then Keystone will quickly provide custom enclosures to meet your exact needs!

In addition, you'll save time when you specify Keystone — because coast-to-coast regional warehouses assure you of getting *what* you want, *when* and *where* you want it!

Type SC and FC Screw-Cover Pull Boxes

Type A Hinged-Cover Surface Cutout Boxes

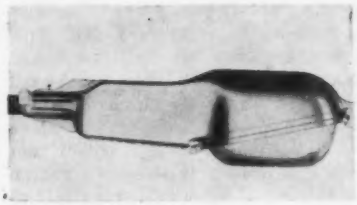
Single and Double Door Current Transformer Cabinets

Type PF and PS Telephone Cabinets

3 NEW CATALOGS—Contain complete information on the entire Keystone quality line. Send for your free set today!

KEYSTONE MANUFACTURING COMPANY

23338 Sherwood Road • Warren, Michigan



Lighting Unit (23)

New mercury-vapor luminaires for streets, expressways, shopping centers and parking lots. Catalog No. 510-CC is a "tilted" design luminaire with both angular reflector and angular refractor. The reflector is aluminum alzak and fastened at an angle inside the housing. The refractor is suspended and sealed within the frame by a gasket arrangement. Unit incorporates a constant wattage ballast which is contained in the housing. A terminal block wired from the socket with glass-braid insulated wire is accessible for wiring through the large hand hold provided in the bottom of the unit.

Nepo Manufacturing Co., 4230 *N. Sayre, Chicago* 34, *Ill.*

Enclosures (24)

Giant multi-door control panel enclosures are now offered in standard sizes. Made to NEMA type 12 and JIC electrical standards, units have 3, 4 and 5 doors. They are 86 ins. high, 14 ins. deep, and range up to 187 ins. in length. Enclosures are oil and dust tight. Behind each set of doors there is a removable panel for mounting electrical controls. A mechanical door interlock is furnished. Enclosures and panels are made of 10-gauge steel.

Hoffman Engineering Corp., Anoka, Minn.

Battery Chargers (25)

A complete line of silicon battery chargers called Magnistrol. The single phase chargers are specifically designed for float charging battery installation ranging from 10 cells to 63 cells in five basic amperage capacities in three voltage ranges. The units are adjustable for charging lead acid, nickel-alkaline or nickel-cadmium batteries. Three-phase input chargers are also available for larger capacity installations. The line is available for wall, relay rack or floor mounting. Literature is available.

Acme Electric Corp., 235 *Water St., Cuba, N. Y.*

Electric Saw (26)

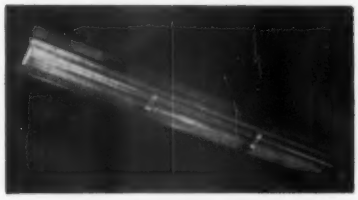
A 2-speed reciprocating electric saw, called Recipro Saw, has been announced. The lower of the two speeds will allow users to cut metal fast with minimum blade wear; while higher speed will permit fast cuts in wood, plastics, fiberboard and similar materials. Model 700 combines the function of a hack saw, keyhole saw and hand saw in a single power tool. Another feature is the off-center location of the blade which allows cutting close to corners. The combination of the right-hand blade location and the fact that the blade can be inserted in the saw facing up or down, permits cutting close to obstructions at both the operator's right and left side.

Skil Corporation, 5033 N. Elston Ave., Chicago, Ill.

Fixtures (27)

A line of approved dust-tight fixtures, Series "FL AV", for Class II, Group E, F & G has been introduced. The line includes 100, 150, and 200-watt sizes, with ½- and ¾-in. conduit openings and a wide choice of reflectors, guards and mounting styles.

Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, Mo.



Fixture (28)

The 98 line vaportight fluorescent fixture is designed especially for wet locations requiring high intensity lighting. Features are noncorrosive extruded aluminum construction; Holophane prismatic lens; extruded sponge rubber gaskets and Camloc fasteners on hinged door frame for easy access and maintenance. Fixture is available for use with one or two slimline or high output 800 ma rapid start lamps in 4-, 6- and 8-ft lengths. Low temperature ballasts supplied for operation down to minus 20°F. Auxiliary clevis equipment for individual or continuous mounting on stems, ceilings, sidewalls and corners between ceiling and wall.

McPhilben Lighting, Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y.

ENTIRELY NEW!

Also Available with U-Ground Receptacle #5225

SPECIFICATION GRADE

Leviton is First with QUIET SWITCHES in the combination duplex line

THE 3 MOST VERSATILE COMBINATION UNITS YOU'VE BEEN WAITING FOR! New Leviton Quiet Switches are mechanical switches, precision-balanced with heavy special silver contacts, magnetic arc-snuffing action. The movement is so quiet you can hardly feel it!

AND YOU GET ALL THESE FEATURES TOO!

- POWER OUTLET has bronze double-wiping contacts for longer life and pressure grip.
- PILOT LIGHT takes standard S-6 candelabra lamp that's easily removable. Nickel-plated protective hood over lamp.
- RUGGED CONSTRUCTION! Base molded of brown phenolic...covers of either brown phenolic or ivory thermosetting plastic. And heavy gauge rust-proofed underslung steel strap is riveted through cover and body to form a permanent assembly.
- EASY TO INSTALL! Large head No. 8 terminal screws have deep milled slots for easy wiring. Accommodate up to No. 10 conductors. Wiring diagram furnished with unit. Wide plaster ears on strap make wall alignment easier.
- ECONOMY! Save installation costs—no extra box and wall plate necessary. Save wall space, too—single gang wall plate replaces double gang.

WRITE FOR FULL DETAILS TODAY!

YOUR BEST JOBS ARE DONE WITH...

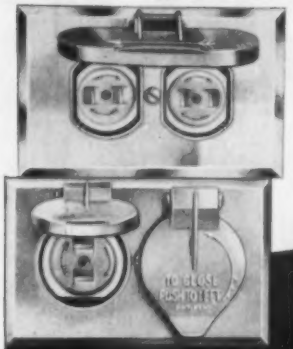
LEVITON

LEVITON MANUFACTURING COMPANY, INC.
BROOKLYN 22, New York
Chicago • Los Angeles
Leviton (Canada) Limited, Montreal

Listed by Underwriters' Laboratories, Inc.

For your wire needs, contact our subsidiary AMERICAN INSULATED WIRE CORP.

AT LAST! TRULY WEATHERPROOF



SELF CLOSING COVERS

SELF CLOSING OUTLETS

BELL NO-SHOK

Weathertight **RECEPTACLE** with Waterproof **SAF-T-LOK COVER**

CHECK THESE EXCLUSIVE FEATURES:

PATENTED NO-SHOK SELF-CLOSING OUTLET

- Prevents insertion of metal objects into current-carrying parts; prevents shocks, burns, short circuits.
- Snaps shut when plug is removed.
- Keeps out dirt, rain, snow — better electrical contact.

SAF-T-LOK WEATHERPROOF COVER

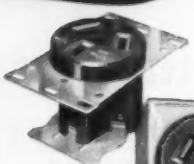
- Locks in open position
- Closes with slight finger pressure
- Can't be loosened or pulled off

NEW

DE LUXE RANGE and DRYER POWER OUTLETS

30 and 50 AMP. Grounding Type

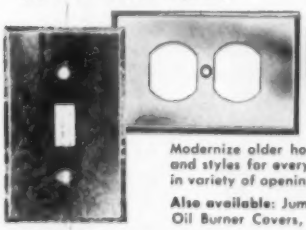
NEWEST DESIGN in FLUSH MOUNTING type features sliding back plate for easy, fast wiring. Newly designed terminal contacts and break-off type yoke, for use with all types (including FS) boxes.



No. 162
50 Amp.

LATEST SURFACE MOUNTING type features removable, interchangeable (30 or 50 Amp.) receptacle. Heavy-duty metal housing, opens easily for fast wiring. Snaps closed with pressure. Shock-proof housing prevents breakage, for use in residential and industrial installations. Available in white baked enamel or aluminum. (Special colors on request.)

No. 163
50 Amp.



...and De Luxe METAL WALL PLATES
in sales-building new finishes

Modernize older homes, beautify new ones, traditional or modern. Sizes and styles for every need — in choice of 14 finishes — from 1 to 10 gang, in variety of openings.

Also available: Jumbo Plates, 1- and 2-gang Louvered Plates, 1- to 5-gang Oil Burner Covers, Engraved Plates, etc.

Make BELL your one source for the best in Weather-proof, the largest line available in 1, 2 or 3-gang outlets, switches or covers. Also No-Shok devices and Metal Wall Plates. ***Write for Catalog and Prices today!***

BELL ELECTRIC CO.
5735 South Claremont Avenue • Chicago 36, Ill.

3-Phase Monitor (29)

Instantly warning of electrical distribution system trouble, this 3-phase monitor gives both visible and audible signals for unbalanced transformer loads, grounds, single phasing and loose connections. The minimum and maximum voltage warning points can be set for each phase. If the voltage drops below these points, a phase pilot light goes on and the alarm bell rings. The case is heavy-gauge sheet metal and can be wall mounted or placed on a desk at any location. The voltmeters which are front panel fused have color coded dials to permit easy identification of unsatisfactory voltage conditions. The alarm circuit operates from an independent power source of 110 volts ac or 6 volts dc. Monitor comes with step-down transformers so it can be used on any delta grounded, delta ungrounded or 4-wire star systems of any voltage.

Principle Research & Development Corp., 200 Citizens Bldg., Aberdeen, S. D.

Silverplating Powder (30)

High amperage electrical connections can be silverplated on the job with a special powder, which is considered equal to electroplating for protection against oxidation on bolted and stationary contacts. Cool-Amp deposits a coat of silver which is easily applied on the job to fuse clips and blades. A sharp steel wire brush or abrasive cloth, clean rag and water are the only equipment required.

Cool-Amp Co., 8603 S.W. 17th Ave., Portland, Ore.

Motor Starter (31)

A new key-operated manual motor starter which will fit any standard single-gang outlet box, is designed for direct operation of motors up to and including 1 hp. It is available in open or NEMA type 1 surface-mounted enclosures, and can be furnished in either

single- or double-pole design. The key-operated starter also incorporates straight-through wiring and a plug-in heater, standard on all 100 Line GE manual starters. Use of a key in starter permits only authorized operation of equipment. The heater plugs in from the front of the starter. Enclosures for the new key-operated starter can be furnished with or without a 115/230-volt neon indicating light.

General Electric Co., Schenectady 5, N. Y.

Rigid-Conduit Hub (32)

The Uni-Seal rigid-conduit hubs are available in ½ to 4-in. sizes. A 360°, uniformly centered, "cold-weld", metal-to-metal seal is obtained by a patented wedge adapter that pulls up tight in the knockout hole when the threaded hub is screwed down. In addition, this rigid-conduit hub bites into the outer box wall metal to eliminate loosening through vibration, thus assuring a perfect ground. The adapter pulls down almost flush with the inside box wall for more wiring room. An insulated throat protects wires without any reduction of throat diameter to hamper pulling wires through. It also protects insulation against cutting and from damage through vibration.

Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Faultfinder (33)

The newly designed Brunt faultfinder is lighter in weight and has double ear phones, covered with foam rubber. Unit is a combination ground detector and fault locator, locates accidental grounds on power systems, both ac and dc, up to 600 volts, while the system is energized. Imposing only two amps on the circuit, it cannot damage equipment on the line.

Parr Manufacturing Corp., 44 Austin St., Newark, N. J.

The All New
TOLEDO
NO. 58
The Finest of all Power Drives
ALL SIZES UP TO 2"
TOLEDO 58 POWER DRIVE
WEIGHS ONLY 73 LBS.
For performance, dependability and quality, this rugged little workhorse can't be equaled. Its new Spin Torque Chuck virtually eliminates the chance of chips falling into moving parts . . . heavy-duty sealed gear train is factory-lubricated . . . powerful TOLEDO motor with rugged switch draws only 13 to 14 amps at full load . . . new centering device for instant, accurate centering . . . heavy-gauge steel base with center screw for bench or stand mounting in any position through 360° . . . many other outstanding TOLEDO features. Accessories include a lightweight folding stand with cast top and sturdy folding steel tray. Write for free literature today and see the new 58 at your supplier's soon.
Sealed Gear Train with precision hobbed helical gears is factory-lubricated—complete unit easily removed.
Quality Checked
sold through your favorite distributor
TOLEDO
BUILDERS OF THE WORLD'S FINEST PIPE TOOLS
THE TOLEDO PIPE THREADING MACHINE COMPANY TOLEDO 4, OHIO, U. S. A.

what do you want in a flexible control cable?
You'll find it in
THE BIG NEOPRENE LINE...
BRONCO
Certified
66
NEOPRENE
TYPE SO, UL APPROVED
How many conductors?
Bronco 66 Certified is made with from 5 to 60 conductors – more on special order – and carried in stock in nation-wide company warehouses.
What A.W.G. size?
Bronco 66 Certified ranges from size 18 through 4.
Highest Neoprene content!
Bronco 66 is a true Type SO, oil-resistant cable, the only portable control cable to bear UL approval. Outer protecting jacket is certified by a Registered Professional Engineer to contain not less than 67.32% Neoprene – highest content in the industry!
Patented Branding!*
Molded* permanently into the jacket are "Bronco 66 Certified," type, size, number of conductors, rated voltage. With data repeated every two feet exactly, cable is self-measuring.
Want real flexibility?
You get a degree of flexibility that can't be equalled because only Bronco 66 Portable Control Cable is Synchro-Cured, fine stranded, electrically annealed for maximum flex life.
Also stationary control cables and shielded control cables
*U.S. Patent No. 2867001
WRITE FOR FREE, CONDENSED CABLE CATALOG
WESTERN INSULATED WIRE CO.
Los Angeles 58, California

Power Centers (34)

The new line of DT-3 power center ratings from 45 through 300 kva has been extended to include a 500-kva unit for use in applications up to 5000 volts. Improved design techniques and use of 150°C rise Siliclad insulation allow the 500-kva unit, including load-break switch and panelboard, to be contained within a height of 75 ins., a width of 69 ins. and a depth of 40 ins. Total weight of power center is 5200 lbs. It is suitable for office buildings, schools, hospitals, and other locations where noise can be a problem.

Westinghouse Electric Corp., P. O. Box 2099, *Pittsburgh* 30, *Pa.*

Enclosures (35)

Stainless steel enclosures, designed to resist the corrosive atmospheres of meat packing plants, tanneries, bakeries and similar locations, are now available for combination starters. Enclosures are built to NEMA Type 4, water-tight, specifications, and are constructed of heavy-gauge, AISI No. 302 stainless steel. The non-ferrous operating handle assembly and conduit hubs are chrome-plated. Bulletin 8538-SP11 is available.

Square D Company, 4041 *N. Richards St., Milwaukee* 12, *Wis.*

Electrode Holder (36)

A new holder for arc welder electrodes resembles a large calibre automatic pistol grip, with a built in safety cut-out to prevent accidental "flashes" or shocks. It has heavy duty milled copper jaws that are adjustable to accommodate rods of different diameters. Has improved pushbutton stub ejector. The case of the Handi-Arc is made of high impact phenolic plastic.

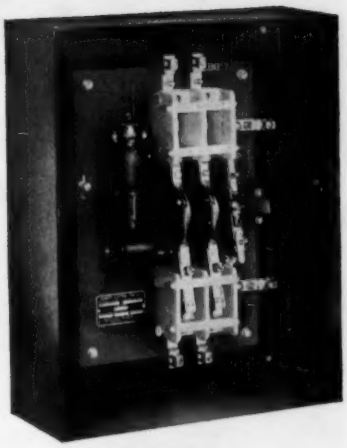
Frank Niemi Metal Products, Inc., Gurnee, Ill.

Vertical File (37)

A mobile vertical file for sheets up to 5½ ft long. It glides on ball bearing casters and can be moved to any desired location. They can be used in batteries or back to back in the center of a room. When equipped with brackets and binders, the rolling stand accommodates up to 1200 large sheets. It is 24 ins. wide and made of 14 gage tubular steel, finished in grey baked enamel.

Plan Hold Corp., 5204 *Chakemco St., South Gate, Calif.*

IMMEDIATE FULL LIGHTING INTENSITY IN TRANSFORMER-TYPE DIMMER INSTALLATIONS with ASCO double throw mechanically held remote control switches...>



APPLICATION

In theaters and auditoriums using dimmer controls to provide smooth and gradual control of the lighting intensity, a means of furnishing full lighting in an emergency is essential. The ASCO Bulletin 915-175 Remote Control Switch provides this full lighting – immediately – regardless of the dimmer position. Control stations conveniently located to responsible attendants permit full control of lighting under emergency and possible panic conditions.

Why Double Throw?

Where rheostatic devices are used as the dimmer means, single throw switches can be used to shunt around the dimmer. However, where transformer type dimmers are employed, the dimmers cannot be shunted. Instead they must be by-passed – in effect, isolated – when an emergency occurs. This necessitates a double throw switch.

Why Mechanically Held?

A switch in this "sensitive" position must be unaffected by line voltage conditions; hum or chatter would be intolerable.

Mechanically Held ASCO Remotes meet these requirements. These switches are *not* affected by line voltage conditions. The coil is momentarily energized during the instant of operation only. Contacts are firmly locked in place by the angular position of the linkages. Results: No Hum–No Chatter – *These Switches Respond Only To Push Button Control.*

ELECTRICAL SPECIFICATIONS

- **Rated in amperes per pole for non-inductive load to 250 volts A-C**
- **Standard listings in capacities from 30 to 200 amperes**
- **Suitable for tungsten lamp load, fluorescent, and all other types of lighting loads**
- **Interrupting capacity 150% of rated current**
- **Thermal capacity not less than 20 times rated current**
- **Barriers on all poles**

CIRCUIT DIAGRAMS

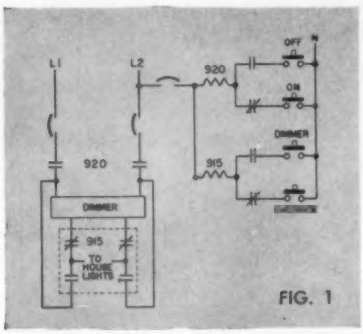


FIG. 1

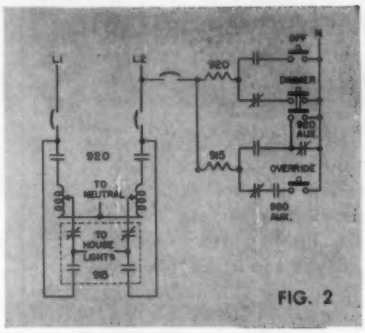


FIG. 2

In the circuit of Figure 1, the Bulletin 920 Switch is used in the conventional manner in the main line. The dimmer control circuits, including the Bulletin 915 double throw Switch are picked off the load side of the Bulletin 920. The Bulletin 920 Switch provides on-off control. The Bulletin 915 double throw Switch provides dimmer by-pass control. Should it be necessary to have full illumination, depressing the "over-ride" button by-passes the dimmer control.

Obviously pressing the "dimmer" button again places the transformer in the circuit. Additional control stations can be added by parallel connections.

An unusual contact arrangement is shown in Figure 2. When the Bulletin 920 Switch is thrown to the "Off" position, the dimmer switch (Bulletin 915) automatically operates to the "dim-light" position. This is accomplished through the use of auxiliary contacts on the Bulletin 920 Switch.

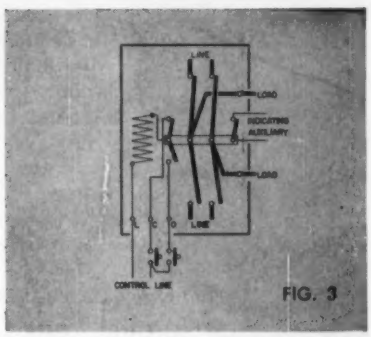


FIG. 3

ELECTRICAL CONNECTIONS. Wiring diagram of Bulletin 915-175 Remote Control Switch. Note control circuit is arranged for 3 wire push button control.

For complete information on ASCO Remote Control Switches for lighting and mixed loads, write for Switch Catalog 57S-2 or have the ASCO Engineer call.

Automatic Switch Co.

50-J Hanover Road, Florham Park, New Jersey, FRontier 7-4600

AUTOMATIC TRANSFER SWITCHES · SOLENOID VALVES · ELECTROMAGNETIC CONTROL

ASCO®

"SEEMORE" SAYS: A COMPLETE FAMILY OF GUTH BRASCOLITE

PIN-HOLES

for any size lamp—from 75 to 1,000 watts

A complete line of versatile, high-quality recessed fixtures for "pinpoint" light control in auditoriums, stores, churches, etc. They provide high-intensity lighting from a nearly invisible source—all you see is the "pin-hole!" U.L. Listed.

Every model is designed for easy installation, relamping and cleaning

SHOVEL YOUR LIGHT TO WHERE IT'S NEEDED

300 to 1,000 watt models available with "light shovels"... for directing light to walls or other specific areas.

WRITE FOR "PIN-HOLE DATA SHEETS" TODAY

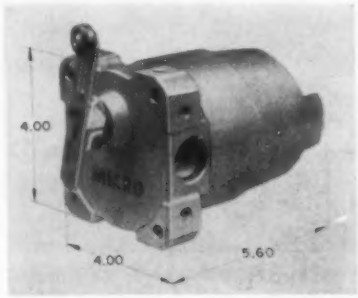
Guth brascolite

THE EDWIN F. GUTH CO.
ST. LOUIS 3, MISSOURI

Terminal **(38)**

An electrical lug for use with either aluminum or copper cable features indicating screw for proper compression. Bared, cleaned conductor end is inserted into wire bore in which cable compound has been factory-applied. Compression screw is tightened until appropriate marking on screw matches with cable size, indicating correct degree of tightness. Lug is available in four sizes to handle a wire range from No. 8 to 500 MCM.

Thomas & Betts Co., 36 Butler St., Elizabeth, N. J.

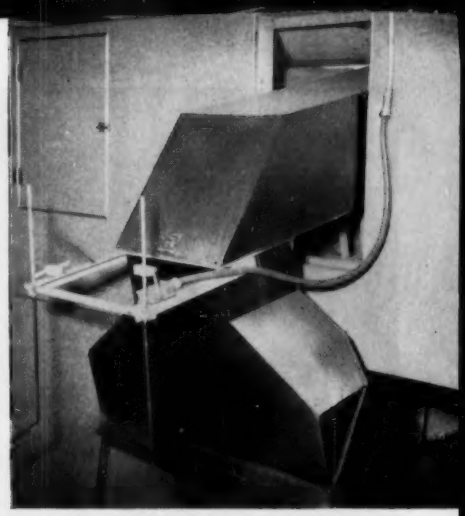


Switch **(39)**

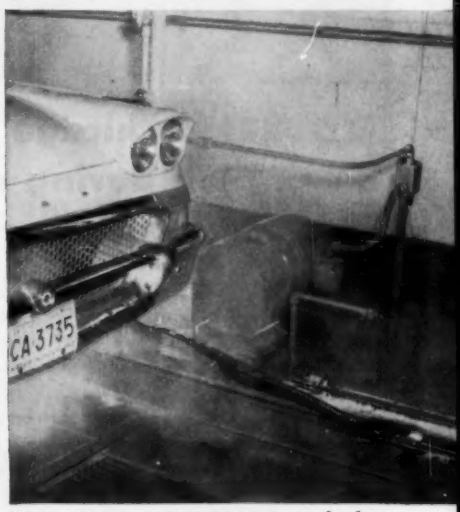
A new enclosed switch listed by UL as being raintight as well as explosion-proof has been introduced. Unit 2CX3 has aluminum die-cast housing and dome cover. UL lists the switch as being suitable for use in Class I, Groups C and D; Class II, Groups E, F and G. Electrical capacity is 20 amps, 125, 250 or 460 volts ac. Contact arrangement consists of two single-pole, double-throw replaceable switching units. Roller arm is moved clockwise to actuate one unit and counterclockwise to actuate the other unit. Data Sheet 156 is available.

Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

CONNECTIONS TO MOTORS driving the horizontal and vertical brushes in the Sherman Body Brush Machine at Jax Kar Wash are protected from water, detergent, and vibration by Sealtite flexible, liquid-tight conduit.



ELECTRICAL CONNECTIONS at the Sherman 100-hp warm-air drying system must withstand heat, moisture, and flexing—are guarded by Sealtite.



STEAM, WATER, AND DETERGENT are the hazards at the Jax Wheel Washer. Connections to motors are protected by Sealtite.

MODERN CAR WASH USES SEALTITE FLEXIBLE, LIQUID-TIGHT CONDUIT TO GUARD WIRING FROM WATER, DETERGENTS, DIRT, VIBRATION

The automatic equipment at Jax Kar Wash stations in Detroit and Birmingham, Mich., takes quite a beating. Each plant may handle up to 1700 cars a day. Water, steam, strong detergents, almost constant vibration and flexing are particularly tough on electrical connections. With previous equipment, shorts would shut down operations from time to time. In new machines shown above, Sherman Car Wash Equipment Co. protected the wiring with Sealtite. Jax Kar Wash happily reports that they have suffered no electrical breakdowns.

WHERE TO GET SEALTITE – Electrical Wholesalers stock Types U.A. and E.F.† Sealtite in easy-to-handle coils, in black or gray. Be certain you ask for and get the quality conduit printed "Sealtite" and "Anaconda" on the cover. Buy it in long lengths on reels or in cartons and cut it on the job without waste. Your wholesaler also stocks liquid-tight connectors.

Free Booklet S-542 gives full information on Sealtite. Write: Anaconda Metal Hose Division, The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. Sealtite is approved by Canadian Standards Association.

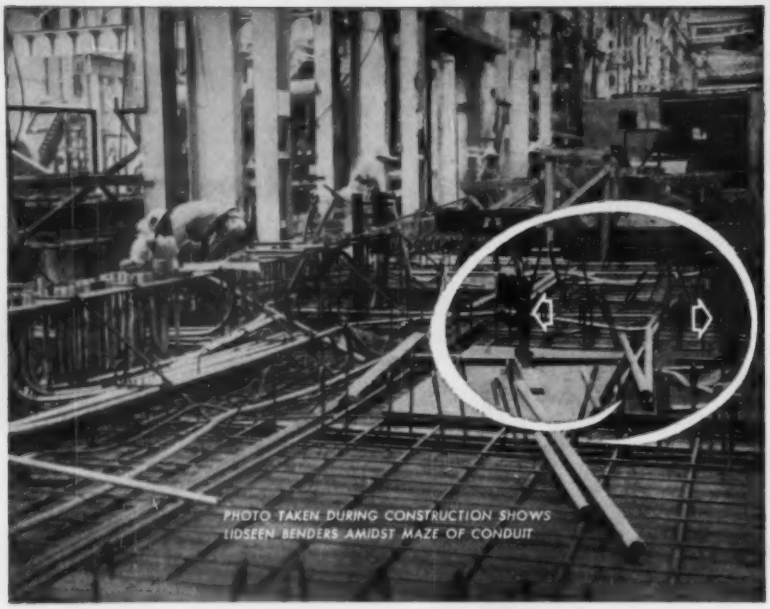
†Pat. Applied For 59136

TYPE U.A. Tough, extruded cover seals out moisture, oil, dirt, chemicals and corrosive fumes. Copper conductor wound spirally gives positive ground inside the conduit.

Insist on the conduit marked **SEALTITE®**

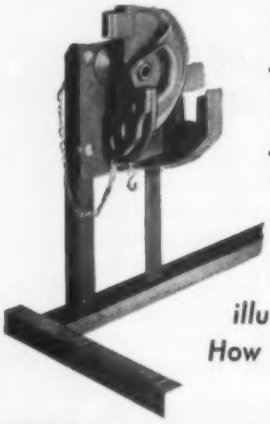
flexible, liquid-tight conduit

an **ANACONDA®** product



LIDSEEN "Chicago" Benders on the job during construction of $200,000,000 Kaiser Aluminum Plant

By assisting the Foothill Electric Company, the Lidseen "Chicago" Pipe Bender played a vital role in the installation of this huge, complex electrical system of the new Kaiser Aluminum Reduction Plant and Rolling Mill. Being the largest single industrial development in West Virginia it required about 2,000,000 pounds of conduit and over 5000 precision bends. Over 30 lineal miles of aluminum conduit alone was used. The Lidseen bender is and proved to be a real on-the-job tool . . . it's rugged, has ideal working height, gives accurate bends every time . . . no strain, slipping or loose parts to worry about. Ask the electrician who is using one; he will tell you it's the finest tool available and at a price that is eminently reasonable.

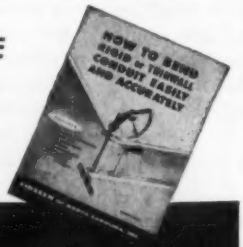


BENDING CIRCLES: INSIDE RADIUS

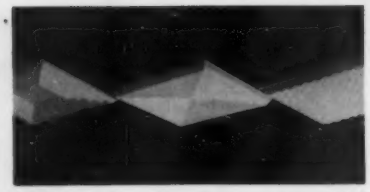
	No. 1	No. 1T
½" conduit or pipe	2"	EMT 3"
¾" conduit or pipe	4⅛"	EMT 4½"
1" conduit or pipe	5¾"	EMT 6½"
	No. 2	**No. 2T**
1¼" conduit or pipe	7¼"	EMT 9½"
1½" conduit or pipe	8¾"	EMT 10½"

Illustrated: No. 1 for bending ½", ¾" and 1" rigid conduit

Write for FREE illustrated Folder on How to Bend Conduit



LIDSEEN
OF NORTH CAROLINA, INC.
1050 FIRST STREET, HAYESVILLE, NORTH CAROLINA
PHONE HAYESVILLE 2000



Diffuser **(40)**

A new plastic luminous ceiling diffuser on which dirt specks or stains are not visible. Each diffuser panel consists of two plastic sheets placed 1½ ins. apart and fastened around the perimeter with a metal edge. Light transmission is 45-50%. Diffusers are white plastic, 2 by 2 ft and come in several new designs as well as the standard patterns.

Western States Equipment Co., P. O. Box 7211, Oakland 1, Calif.

Control **(41)**

A new control for capacitor switching is now available. Enclosed in a Flexitest case, the control contains an improved master induction disc relay which has a dual range of adjustment—from ½ to 1 amp and from 1 to 4 amps. Two thermal plug-in-type fixed time-delay relays, one in the close circuit and one in the trip circuit, provide a predetermined time delay that eliminates unwanted switching operations from rapid system fluctuations of short duration. The fixed time-delay relays are in the circuit only during automatic operation. To keep the capacitors connected and prevent unwanted switching operations, a new toggle relay is used. With this relay, Type SX, the oil switches remain closed and capacitor bank remains connected when voltage is restored. A low-voltage lightning arrester has been added.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Aerial Cable Blocks (42)

New aerial cable blocks are now available in two types for mounting on the messenger or to be hung from pole. No. 9712 is furnished with socket connector for mounting on pole—ideal for the installation of pre-assembled self-supporting aerial cable. No. 9710 has screw type clamp for mounting directly on messenger for installation of messenger and ring, or field spinner self-supporting types of aerial cables. Aluminum alloy sheave mounted on ball bearings. Both types are side opening with positive locking head. Both blocks can be furnished with Type GNA permanently bonded neoprene lining in the sheave grooves.

Sherman & Reilly, Inc., First and Broad Sts., Chattanooga, Tenn.

Capacitors (43)

Single-row and cluster-type racks for 100-kvar capacitor units facilitate installation of pole-mounted capacitor banks. Single-row racks can accommodate 300, 600 or 900 kvar, while cluster-type racks can accommodate 600, 900 or 1200 kvar. These racks can be direct-pole mounted or pole-band mounted by means of an optional accessory. Both types of racks are fabricated of corrosion-resistant, lightweight aluminum. All-welded construction is used for the single-row racks and for the single-phase sections of the cluster-type racks. A ground clamp and aluminum-coated steel bolts for mounting capacitor units are furnished with each rack. Single-row and cluster-type racks are available as complete assemblies, switched or unswitched. They are assembled and wired for immediate field installation. Depending upon kvar rating, these assemblies generally are applicable on distribution systems rated 2400 volts delta through 13,800 volts multi-grounded wye.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, *Wis.*

RIDGID No. 2-S Spiral Reamer
⅛" to 2" Capacity . . . Self-Feeding for Least Effort

For Smooth, Easy Reaming it has to be

RIDGID®

No. 2
⅛" to 2" Capacity

No. 3
⅜" to 3" Capacity

RIDGID "LonGrip" Reamers
No Thinned or Flared Walls

Take your choice—Spiral or "LonGrip"—you can't beat these RIDGID Reamers. For hand reaming, you probably prefer the effortless self-feeding Spiral; for power use, the "LonGrip" five-fluted reamers. Heat-treated cutting edges offer extra-long service . . . will not dig in and thin or flare walls. All RIDGID Ratchet Reamers come equipped with handle.

Your Supply House has them.
For smoother, faster reaming
order yours today!

RIDGID
The Ridge Tool Company, Elyria, Ohio, U.S.A.

WAGNER REPLACEMENT MOTORS

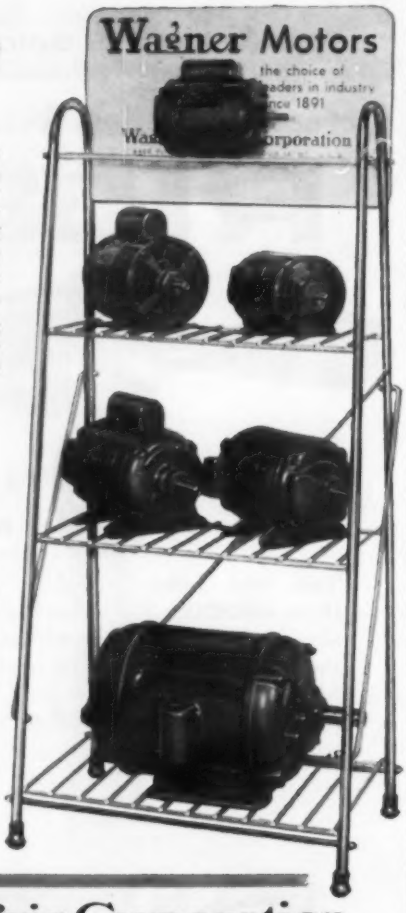
There are times when repairing an old motor is a waste of time and money to you and your customer. By replacing worn-out motors with new Wagner motors you can save yourself valuable time that can be spent on more profitable jobs and pocket a nice profit from the new motor sale.

So, don't try to repair a motor that is "too far gone." Sell a new Wagner motor. You *and* your customer will be glad you did.

It's easy with the WAGNER MOTOR MERCHANDISER

This attractive stand makes the job of selling Wagner Replacement Motors a snap. Chrome and cadmium plate and a three-color sign at the top gives this motor merchandiser plenty of eye appeal, and with the motors out where your customers can examine them carefully, selling practically takes care of itself. The cost is just $9.95 with an order of any 10 Wagner motors in one lot. Jet pump motors may be included.

Contact the nearest Wagner Branch Office now. Order the handy Wagner Motor Merchandiser *and* a selection of new Wagner Replacement Motors.



WR59-4

Wagner Electric Corporation

6413 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

OVER 850 AUTHORIZED SERVICE STATIONS OR PARTS DISTRIBUTORS

MOTORS • BEARINGS • STANDARD ROTORS • BRUSHES • CAPACITORS • COMMUTATORS

Fluorescent Lamp (44)

A fluorescent lamp that requires neither starter nor external ballast and which can be mounted in a single conventional screw base has been developed. The need for an auxiliary starter is obviated by including a bi-metallic starting switch as an integral part of the lamp; the need for an external ballast is eliminated by an incandescent filament within the lamp itself. New lamps can be built for either conventional mounting, with terminals at both ends, or for mounting at one end only. The company has not made plans to market the self-ballasted fluorescent lamp, but are studying possible applications with architects, designers and fixture manufacturers.

Westinghouse Lamp Division, Bloomfield, N. J.

Floodlights (45)

Totally new outdoor floodlights designed for locations where concentrated, high-intensity lighting is required. They can be used singly or in clusters. Clear or colored lens kits fully seal units for face-up use in rain or snow. All floodlights are heavy-duty, weatherproof, corrosion-proof die-cast aluminum throughout. Units are fully UL-approved and CSA-approved for outdoor service. Bulletin P-110 is available.

Stonco Electric Products Co., 333 Monroe Ave., Kenilworth, N. J.

Enclosed Gutters (46)

Enclosed raintight gutters that provide all-weather protection for wiring are suitable for all applications requiring positive protection from the elements. Designed primarily for outdoor installation, the gutters feature welded-on tops with deep overhanging flanges to prevent adverse elements from damaging the wiring. They are available in

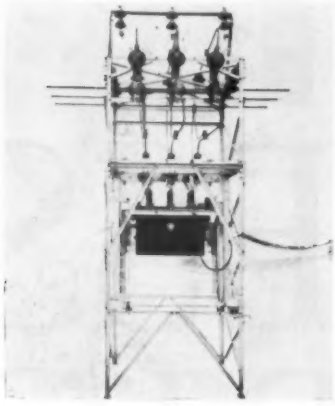
standard 4- by 4-in. and 6- by 6-in. sizes in 1-ft through 6-ft lengths. Formed of code gauge galvanized sheet steel, all are furnished with combination knockouts on the bottoms, and all feature spot welded construction.

Keystone Manufacturing Co., 23328 Sherwood Rd., Warren, Mich.

Wire Reel (47)

The new "Kinkfree" portable wire reel permits Romex and other wire to be pulled from the manufacturer's reel kink-free. Portable wire reel is a steel box with a free-action ball-bearing turntable on which the coil is placed. The wire is pulled from the outside of the coil through a guide in the side of the box. By stacking portable wire reels, two, three or more wires can be pulled kink-free and installed at the same time. It will handle full coils of 12-2 or 12-3 Romex or similar wire, 500-ft rolls of TW or underground wire.

LaRaus Manufacturing Co., Inc., LeRoy, N. Y.



Substation Unit (48)

A new open-type unit structure combines the secondary bus, oil circuit recloser, bypass switches, arresters, and outgoing circuit attachment into one assembly. Stations are easily assembled in the field. Units are rated for use on lines having phase-to-phase voltages up to 15 kv. Type R or W reclosers can be installed in the new unit. Interrupting capability up to 200 mva is available, and circuits can serve continuous loads of 560 amps per phase. BIL is 110 kv. Automatic contacts connect the recloser in the circuit when it is hoisted into position.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

. . . by more contractors than any other portable cord

The cord that clicks with contractors is ROYAL . . . and the reasons are many. Made to high standards of quality, and controlled every step of the way under one roof, Royal cords offer the quality characteristics that you look for most in your work — flexibility, durability and dependability.

Royal offers the most complete range of types and sizes, too, through your electrical wholesaler; one recognized and respected name on all your flexible cord — Rubber, Neoprene and Plastic Jacketed Portable Cords, Thermostat Cable, Lamp and Fixture Wires, Machine Tool Wires, and heavy duty "POWR-KORD" extensions.

Next time you order cords, specify ROYAL.

Royal Electric Corporation
Pawtucket, Rhode Island

ROYAL ELECTRIC ...an associate of ITT

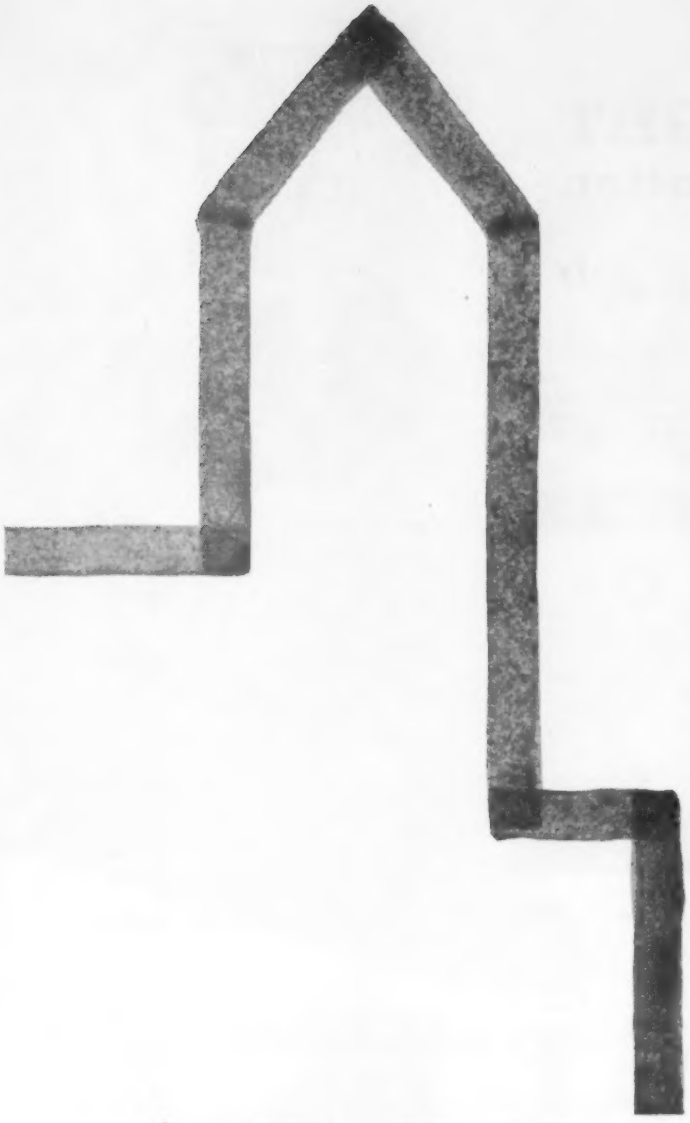
Westinghouse announces...

BUILD BUSINESS ELECTRIC

a cooperative plan for generating new business . . . developed by Westinghouse

Because of the tremendous surge in new building construction, owners and operators of physically sound . . . but old buildings . . . have found themselves hard-put to maintain maximum rentals. New buildings have set high standards of comfort, convenience and other elements of "tenant appeal" that are opening a tremendous new market—the modernization of old commercial buildings.

The essential first step in any building modernization is the *electrical distribution system*. And the *only* person able to furnish and install this system is the electrical contractor. Tenants often prefer



ALLY

for qualified electrical contractors

to stay in their present building if it can give them the comfort and convenience of high-level lighting; year-round air conditioning; fast, quiet automatic elevators; and other electrical services. Before a building owner can furnish these services, he must have adequate power, and this depends entirely on his distribution system.

for this reason, Westinghouse has developed BUILD BUSINESS ELECTRICALLY!

. . . a sales program which enables the electrical contractor, electric utilities and Westinghouse to:

1. Cooperate profitably in selling the electrical modernization of commercial buildings.
2. Approach building owners with a strong selling story on the economic benefits of complete electrical modernization.
3. Utilize the finest sales tools, promotion and other materials in the industry.
4. Assure the proper installation of the best quality electrical products for the benefit of the building owner.

For complete information on the BUILD BUSINESS ELECTRICALLY plan, call your nearest Westinghouse representative.

J-94125-R

Westinghouse offers the most complete line of products for electrical modernization.

You will find over 250 pages of Westinghouse product data in Sweet's Architectural and Construction Files.

YOU CAN BE SURE...IF IT'S

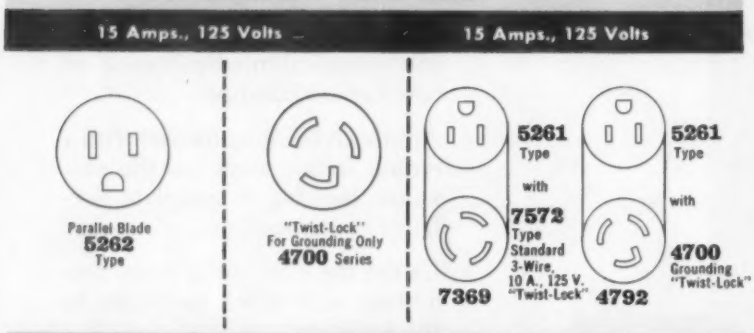
Westinghouse

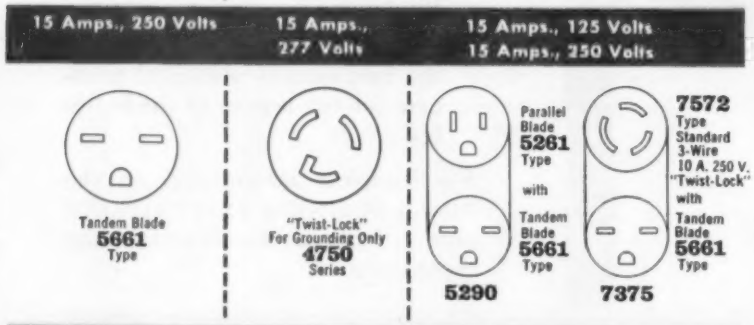
WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

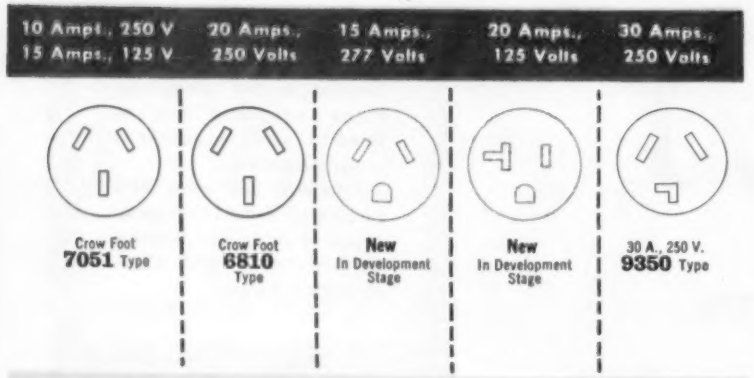
IT PAYS TO HAVE GOOD CONNECTIONS — HUBBELL

...the RIGHT configuration for every grounding job

Ever since 1947, when the Schirmer report cited the "shocking" need for adequate grounding, Hubbell has been developing and adding to their grounding device line. As new code requirements were introduced, new wiring device configurations were designed to prevent accidental interchange between units of different ratings. Here are the many faces of Hubbell's grounding family. By presenting it in this form we hope to clarify this subject and aid you in specifying the right unit for the job.


15 Amps., 125 Volts
15 Amps., 125 Volts
Parallel Blade 5262 Type
"Twist-Lock" For Grounding Only 4700 Series
5261 Type with 7572 Type Standard 3-Wire, 10 A., 125 V. "Twist-Lock" 7369
5261 Type with 4700 Grounding "Twist-Lock" 4792


15 Amps., 250 Volts
15 Amps., 277 Volts
15 Amps., 125 Volts
15 Amps., 250 Volts
Tandem Blade 5661 Type
"Twist-Lock" For Grounding Only 4750 Series
Parallel Blade 5261 Type with Tandem Blade 5661 Type 5290
7572 Type Standard 3-Wire 10 A. 250 V. "Twist-Lock" with Tandem Blade 5661 Type 7375


10 Amps., 250 V
15 Amps., 125 V
20 Amps., 250 Volts
15 Amps., 277 Volts
20 Amps., 125 Volts
30 Amps., 250 Volts
Crow Foot 7051 Type
Crow Foot 6810 Type
New In Development Stage
New In Development Stage
30 A., 250 V. 9350 Type

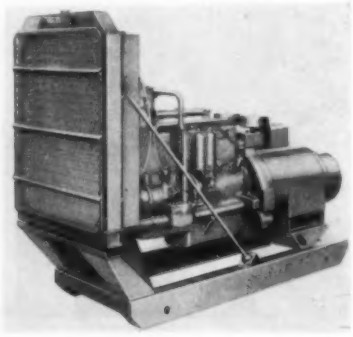
HARVEY HUBBELL, INCORPORATED

BRIDGEPORT 2, CONNECTICUT

Manual Starter **(48a)**

An all new advanced design manual starter rated through 7½ hp 440-550-volt, ac and 2 hp, 230-volt dc. A direct mechanical acting thermal overload operates independently of the second overload or pushbutton mechanism. This "trip-free" overload unit makes it impossible for the operator to hold the circuit closed against overload. When in the "Jog" position, it allows contact make only while the "Start" button is held in the depressed position. A second thermal overload unit may be added to single phase starters in the field.

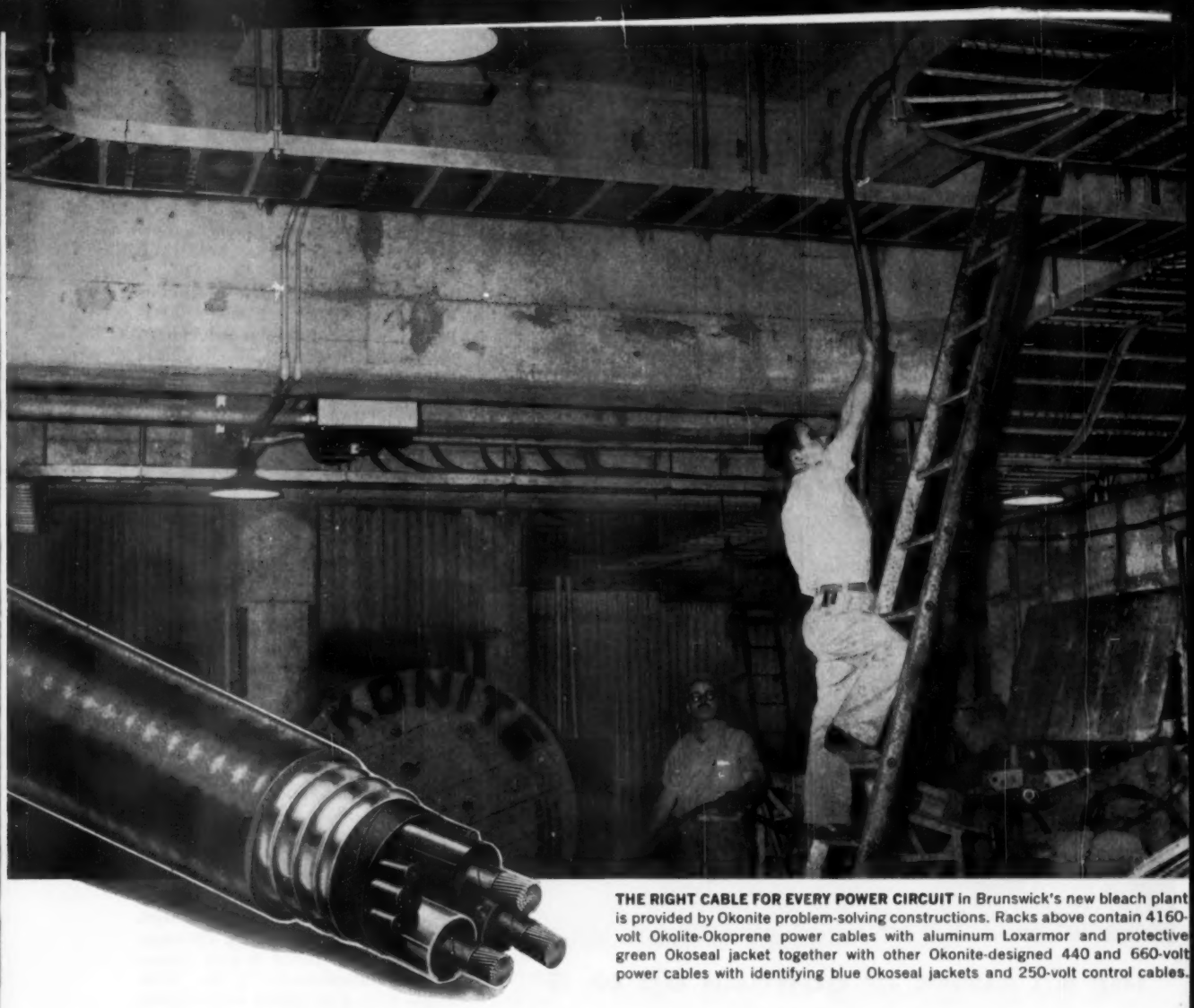
Furnas Electric Co., 1067 *McKee St., Batavia, Ill.*



Electric Plant **(48b)**

Model 100R81 is a new 100 kw 120/208-volt ac electric plant equipped for remote starting. It is adaptable to practically all applications and voltage requirements, featuring a 12 lead, reconnectible revolving field with static exciter. It is electrically cranked with an automotive type 12-volt starting battery. A 6-cylinder engine develops 220 hp at 1800 rpm.

Kohler Co., Kohler, Wis.



THE RIGHT CABLE FOR EVERY POWER CIRCUIT in Brunswick's new bleach plant is provided by Okonite problem-solving constructions. Racks above contain 4160-volt Okolite-Okoprene power cables with aluminum Loxarmor and protective green Okoseal jacket together with other Okonite-designed 440 and 660-volt power cables with identifying blue Okoseal jackets and 250-volt control cables.

Okonite cable gives Brunswick Pulp & Paper maximum protection in chemical atmosphere—at lower costs

PROBLEM: For one of its vital electrical circuits, Brunswick Pulp and Paper Company's new bleach plant for modern, high-graded processes needed a primary distribution cable of 4160-volt capacity that could stand up to chemical attack. Mindful of the penalties of plant down time they sought maximum circuit security. They also wanted lower installation costs.

SOLUTION: They got both a superior cable and a less expensive installation by using Okolite-Okoprene 5kv cable with an aluminum Loxarmor covering and Okoseal jacket.

HERE'S WHY: *Okolite insulation*, applied by Okonite's exclusive strip process for maximum quality control, is moisture, ozone and heat resistant with lasting high dielectric strength. *Okoprene sheath* gives positive protection from moisture and most harmful acids, oils and chemicals. Lightweight *Aluminum Loxarmor*, for use in racks, eliminates the installation expense and the difficulty in changing a conduit system. *Okoseal* PVC (polyvinyl chloride) jacket was selected to counter specific chemical conditions in the plant. Colored green, it also identifies the primary circuit.

Okonite makes cables by all the known methods, has a background of 80 years of experience. You will get sound and unbiased recommendations when you call on your Okonite representative. In the meantime, ask for Bulletin EC-1117 on "How to Choose Insulated Cable."

THE OKONITE COMPANY
Subsidiary of Kennecott Copper Corporation
Passaic, New Jersey

where there's electrical power . . . there's **OKONITE CABLE**

6377

Conduit Holes in Seconds with

Greenlee Hydraulic Punch Driver

for all sizes of conduit up to 5"

Here's the fast, cost-cutting way to enlarge knockouts or make entirely new openings for conduit up to 5". With a few easy strokes of the handle the GREENLEE No. 7646A Hydraulic Knockout Punch Driver punches through metal up to 10-gauge. Makes hole-cutting in tight, cramped quarters far easier . . . no wrench space needed. This lightweight, portable unit is designed to drive all standard GREENLEE knockout punches for ½" through 5" conduit. Comes to you complete with hydraulic pump, hose, ram, adapter screws, and die sleeves in metal carrying case. Ask your distributor for a demonstration of this timesaving tool, or write for Bulletin E-274.

Wide choice of sets with Hydraulic Driver and Greenlee Knockout Punches

Set No. 7310 (right) — Driver and set of 10 GREENLEE Knockout Punches for ½" - 4" conduit. Two metal cases.

Set No. 7306 — Driver and set of 6 GREENLEE Knockout Punches for ½" - 2" conduit. Metal case.

Set No. 7304 — 4 GREENLEE Knockout Punches for 2½" - 4" conduit. Metal case.

Knockout Punch No. 743 — For 5" conduit.

A COMPLETE LINE OF KNOCKOUT TOOLS, HAND OR HYDRAULIC PUMP OPERATED

GREENLEE TOOL CO. GREENLEE

1736 Columbia Ave., Rockford, Illinois

Product Briefs

(49) The Rawlplug Company, Inc., New Rochelle, N. Y., has introduced a new combination masonry **drill-anchor,** called "Saber-Tooth," which drills hole and fastens to concrete. . . . (50) A tubeless photoelectric outdoor **lighting control** that meets TDJ-148 EEI-NEMA standards has been developed by Precision Magnetic Controls, Inc., Ridgewood, N. J. . . . (51) Hilti Rapid Fastening Systems, Inc., Stamford, Conn., has announced a new DX-100 power-assisted **drive tool** for fastening into concrete, steel and all types of masonry.

(52) Two new series of Thor portable **electric SpeedDrills** in ¼-, ⅜-, and ½-in. capacities—a No. 1200 Series for heavy duty, continuous operation and a No. 1300 Series for intermittent-service applications, have been introduced by the SpeedWay Division of Thor Power Tool Company, LaGrange Park, Ill. . . . (53) An expanded line of low energy safety control **wire** complying with the National Electrical Code for Class 2 circuits has been announced by Chester Cable Corp., Chester, N. Y. Designed for power supply use rated under 100 volt-amps, the wire is now available in a choice of two or three conductors of No. 18 or No. 16 AWG size, parallel.

(54) Skil Corporation, Chicago, Ill., has announced a new **power tool combination**—a ¼ in. right angle drill and line of self-feeding bits. . . . (55) A new, 24-hour silent **burglar alarm system** which links subscribers directly to their local police departments has been announced. It is manufactured by Teletronic Security Systems, Inc., Los Angeles, Calif. . . . (56) Star Expansion Industries Corp., Mountainville, N. Y., is marketing the Star Peak **drill** for use in masonry, brick or stone.

(57) An improved, flexible Plasticote **bus drop cable** has been produced by Chester Cable Corp., Chester, N. Y., to provide greater flexibility in the connection of overhead power sources of industrial machine load centers and control boxes. . . . (58) Arro Expansion Bolt Co., Marion, Ohio, has announced that a self-drilling **expansion shield,** called Silver King, has been added to its line of masonry anchoring devices. . . . (59) The Lima Electric Motor Co., Inc., Lima, Ohio, has announced the addition of straight line **speed reducers** to its line.

Catalogs & Bulletins

(60) INTEGRATED SUBSTATIONS in six standard arrangements involving combinations of single- and double-circuit units, bus and load disconnects, and by-pass switches are described in bulletin 3025. Moloney Electric Co.

(61) SHADED-POLE MOTORS. 8-page catalog R-1 covers four types of reversible, non-geared ac motors, with information on duty cycles, power source considerations, and special features. Barber-Colman Co.

(62) INSULATION for repair and maintenance of motors, generators and electrical or electronic equipment is completely covered in new catalog 30. Insulation Manufacturers Corp.

(63) WELDING CONNECTIONS to copper, steel, cable or flat stock using Thermoweld process, applicable to splice, tap, and grounding connections with cable from No. 4 through 2000MCM are described in new bulletin. Burndy Corp.

(64) READOUT LAMPS. 4-page pamphlet discusses the phenomenon of electroluminescence and its application in lamps now available for display of continually changing numerical or alphabetical information. Westinghouse Lamp Division.

(65) INDUSTRIAL LIGHTING. 16-page booklet gives fixture cost comparisons, cost of lighting per sq ft, and numerous installation photos. Day-Brite Lighting, Inc.

(66) TORQUEMETERS. 2-page bulletin describes series of meters for measuring dynamic torques covering ranges from 5 to 250 oz-in. on shafts turning from 50 to 12,000 RPM. Metron Instrument Co.

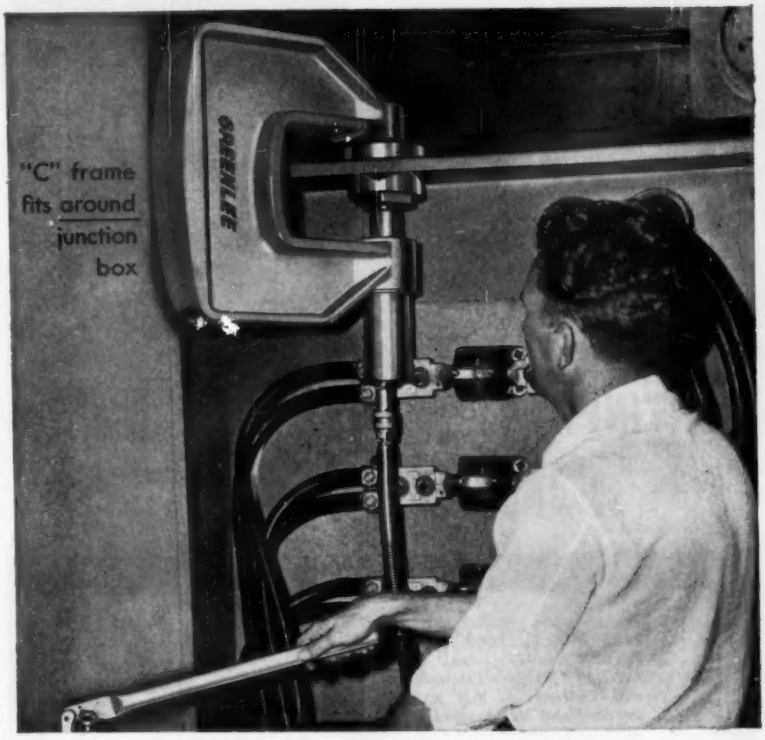
(67) DISTRIBUTION TRANSFORMERS for floodlighting installations. GEA-5683A, 2 pages, describes oil-filled, single-phase, pole-type conventional and self-protected transformers. General Electric Co.

(68) MANUAL STARTERS. 8-page bulletin 11B1 introduces a new complete line rated through 7½ hp ac and 2 hp dc, including data covering design, ratings and prices. Furnas Electric Co.

(69) ENGINE CONTROL for fully automatic starting and stopping of engine-driven generating sets is described in publication 653. Automatic Switch Co.

NEW One-Shot

Hydraulic Knockout Punch Drivers Punch Holes for 1/2″– 4″ Conduit



no pre-drilling or step-up punching!

Save many dollars on conduit installations with the new GREENLEE One-Shot Knockout Punch Driver. Lightweight, easy to carry, powerful! Fast one-man setup and operation. 8″ deep throat lets you position punch exactly where needed. High-strength aluminum "C" frame provides ample rigidity for slicing through 10-gauge steel with a few strokes of the hydraulic pump. No waste motions . . . fast, accurate work . . . better profits per job!

two sizes

No. 1732 (above) fits all GREENLEE Knockout Punches and Dies ½″ — 4″. Weighs only 35 lb.

No. 1731 (right) fits GREENLEE Knockout Punches ½″, ¾″, and 1″ with special dies. Weighs only 15 lb.

Both models are used with GREENLEE hand- or power-operated hydraulic pumps. Ask your distributor for a demonstration, or write for descriptive bulletin E-292.

A COMPLETE LINE OF KNOCKOUT TOOLS, HAND-OR HYDRAULIC-PUMP OPERATED

GREENLEE TOOL CO.

1755 Columbia Ave., Rockford, Illinois

GREENLEE — TOOLS FOR CRAFTSMEN

CONTINENTAL ASBESTOS-INSULATED
POWER CABLE

***TYPE AVA TO 5000 VOLT SERVICE** available sizes: 14 AWG to 1,000,000 CM inclusive. Conforms to N.E. code standard and NEMA standard WC1-1955 and ASA C8.-36-1955.*

Engineered insulated wire and cable from Continental Wire assures maximum Job-Dependability.

Type AVA Power Cable is recommended for use in open or in conduit installations where advantages of excellent current carrying capacity and resistance to high temperature are desired . . . and where operating conditions include oil, grease, corrosive vapors or moisture.

There's a complete line of Continental Insulated Power Cable in sizes 14 AWG to 1,000,000 CM inclusive . . . insulation types include AVA . . . AIA . . . V . . . AVB . . . Silicone Rubber . . . Glass . . . Teflon Tape . . . and Varnished Glass Tape.

For more information write Continental, Wallingford.

continental wire corporation

WALLINGFORD, CONNECTICUT • YORK, PENNSYLVANIA

(70) CARBON BRUSHES—how to get the most from them. 8-page bulletin discusses the purpose of brushes, how they aid commutation, effect of film, wear and chatter, and a classification of brush grades. Superior Carbon Products, Inc.

(71) FILING SYSTEMS. Both vertical and roll filing of blueprints, tracings, etc. are described in 1959 catalog. Plan Hold Corp.

(72) GENERATING PLANTS. 2-page bulletin includes specifications for new line of 20-kw units plus a listing of optional accessories. Jeta, Inc.

(73) AUTOMATIC CONTROL systems used in industry are described in new 4-page bulletin. Control Panel Corp.

(74) ALUMINUM CONDUCTORS —current-temperature characteristics. A 20-page presentation of the latest available information on both ACSR and stranded aluminum conductors, with formulas to facilitate calculation of characteristics for other sizes. Aluminum Corp. of America.

(75) ELECTRICAL CONNECTORS. 48-page bulletin 2711 describes complete new line of plugs and receptacles of environment-resistant construction which are moisture-proof, shock-insulated, dust-tight and corrosion-resistant. Crouse-Hinds Co.

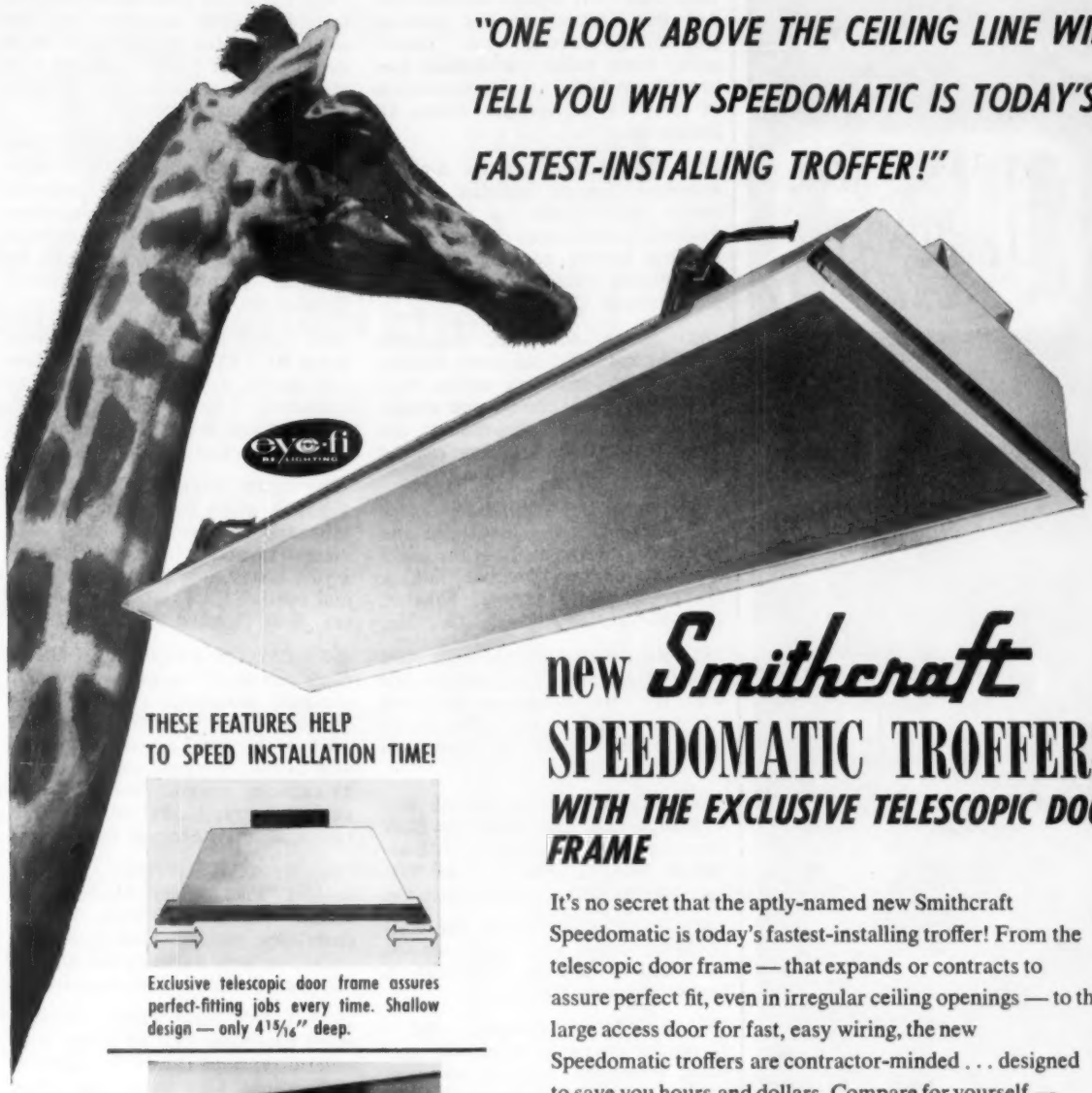
(76) SWITCHES. Brief catalog and price list describes basic snap action switches, enclosed snap action switches, foot switches, mercury switches and actuating switches. PIC Automation Controls Div., General Controls Co.

(77) ELECTROLUMINESCENT light bulbs for commercial applications. Rayescent panels in green, blue or yellow in sizes 2 by 2 ins. to 24 by 24 ins. are described in new booklet which suggests many possible applications. Westinghouse Lamp Div.

(78) PHASE SEQUENCE INDICATORS designed for integration in test stands and panelboards which indicate the order in which voltage peaks of a 3-phase power supply occur are described in 2-page catalog sheet. Opad Electric Co.

(79) DRAFTING SUPPLIES. 1959 general catalog, 24 pages, includes new storage system for large rolled blueprints, charts, drawings, maps and tracings plus flat drawer files and drafting tables and equipment. Stacor Equipment Co.

"ONE LOOK ABOVE THE CEILING LINE WILL TELL YOU WHY SPEEDOMATIC IS TODAY'S FASTEST-INSTALLING TROFFER!"



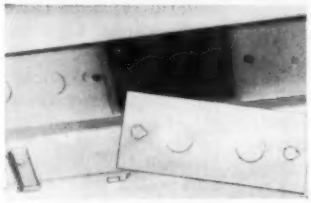
new Smithcraft SPEEDOMATIC TROFFERS

WITH THE EXCLUSIVE TELESCOPIC DOOR FRAME

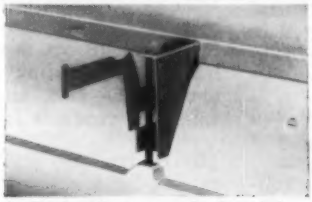
It's no secret that the aptly-named new Smithcraft Speedomatic is today's fastest-installing troffer! From the telescopic door frame — that expands or contracts to assure perfect fit, even in irregular ceiling openings — to the large access door for fast, easy wiring, the new Speedomatic troffers are contractor-minded . . . designed to save you hours and dollars. Compare for yourself — and you'll agree that Smithcraft Speedomatic is truly the fastest-installing troffer on the market today.

THESE FEATURES HELP TO SPEED INSTALLATION TIME!

Exclusive telescopic door frame assures perfect-fitting jobs every time. Shallow design — only 4 15/16" deep.



Exclusive wiring access door saves installation time — large enough to reach through for feed wire.



Troffer installs in seconds, from below, by fast-travelling levelling screws. Only tool needed is a screwdriver.

Smithcraft Lighting CHELSEA 50, MASS.

FREE! The Smithcraft LIGHTESTER . . . enables your customers and prospects to "grade" their own lighting! A creative selling aid for you! For your sample LIGHTESTER, fill out and mail the coupon.

EC-6

Smithcraft Lighting Chelsea 50, Mass.

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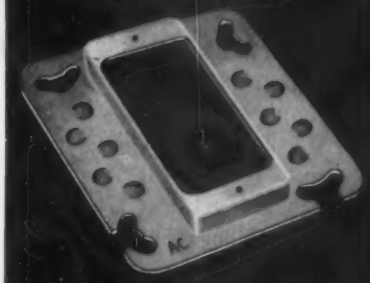

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(80) TEST SET. 4-page bulletin 22-5 describes instrument for making step-voltage-current (or resistance) tests, voltage withstand and breakdown tests on the insulation of electrical equipment. James G. Biddle Co.

(81) PHASE MONITOR for 3-phase systems. 4-page bulletin C-5800 covers instruments for indicating grounds, unbalanced loads, single phasing, arcing, surging and loose connections. Principle Research and Development Corp.

(82) SCREW ANCHORS, expansion anchors and bolts, lag screw shields, toggle bolts, masonry drills, wire connectors, cable clamps and straps, fish tapes and other products are described in new 32-page catalog 100. Holub Industries Inc.

(83) SOUND POWERED TELEPHONES and accessories for industrial and marine use with facilities for selective ringing and common talking are presented in 12-page bulletin. Hose-McCann Telephone Co., Inc.

(84) ALUMINIZED WIRE with steel core for guy wire, overhead ground wire, tie wire, messenger wire and telephone wire is described in 6-page folder DH-537B. American Chain & Cable Co., Inc.

(85) GEARMOTORS, Motogears and fluid drives. 48-page book No. 2747 describes functions of each with selection data, dimensions, load ratings and mountings. Link-Belt Co.

(86) SILICONE PRODUCTS for electrical insulation and other uses are described in bulletin CDS-129A, 8 pages. General Electric Co.

(87) ELECTRONIC SYMBOLS used to designate elements of sound systems, intercoms, nurses' call systems and private telephone systems are contained on a wall chart. Du-Kane Corp.

(88) EXPLOSION-PROOF CONTROLLERS, oil-immersed, for squirrel-cage motors. Starters rated at 2000 to 5000 volts providing built-in short-circuit protection are described in bulletin 14B8750, 4 pages. Allis-Chalmers.

(89) AIR CONDITIONERS for central station applications are covered in 76-page bulletin 9227. American-Standard, Industrial Divsiion.

(90) TABLES AND FORMULAS and graphical symbols summarizing electrical data, properties of materials, measurements and other subjects are gathered in new 120-page booklet B-3677D. Westinghouse Electric Corp.

(91) THINLINE MOTORS. 8-page bulletin GEA-6927 describes new line of motors rated from 1 to 5 hp in dripproof and totally enclosed constructions for limited space applications. General Electric Co.

(92) PACKAGED SUBSTATIONS. Comprehensive 16-page bulletin R-5604-1A covers line of Tranfo-Units for such applications as schools, shopping centers, airports, hospitals, office buildings and hotels, and industrial plants. I-T-E Circuit Breaker Co.

(93) CABLE INSULATION. Technical paper RCT 710 containing 10 tables and charts, a bibliography, and an appendix, is titled "Flame Retardant Polyethylene for Wire and Cable." Rome Cable Corp.

(94) LIMIT SWITCH. Bulletin M-1, 4 pages, gives full descriptive details and engineering details on a rugged precision limit switch using a full, heavy duty latch mechanism and available with 16 different levers. R. B. Denison Mfg. Co.

(95) BATTERY CHARGERS. Bulletin 6259 covers a compact, vertically mounted motor-generator charger designed for lead-acid batteries used in electrical trucks and available in four physical sizes covering 25 capacity ranges, from 0 to 800 ampere-hours. Exide Industrial Division, Electric Storage Battery Co.

(96) STORAGE BATTERIES. 32-page booklet "Facts About Storage Batteries" covers completely battery chemistry, testing, recharging, installation and removal, filling, and storing. Exide Automotive Div.

(97) LIGHT POLE BASES. Catalog sheet describes line of bases with several types of covers for lighting applications, sign mounting, police or fire boxes, traffic signals and electrical enclosures. Spring City Electrical Mfg. Co.

(98) LIFTING MAGNETS. 12-page bulletin 1300 covers both all-welded and bolted magnets up to 80 ins. in diameter, including operating data and lifting capacities. Electric Controller & Mfg. Co.

(99) LUMINAIRES designed for commercial application of Power Groove lamps are described in bulletin 700, including specifications, photometric data and dimensions. Lighting Products Inc.

(100) STORAGE BATTERIES. Brochure I-1 describes new replaceable-cell, lead acid battery for industrial applications. Scranton Cellomatic Battery Corp.

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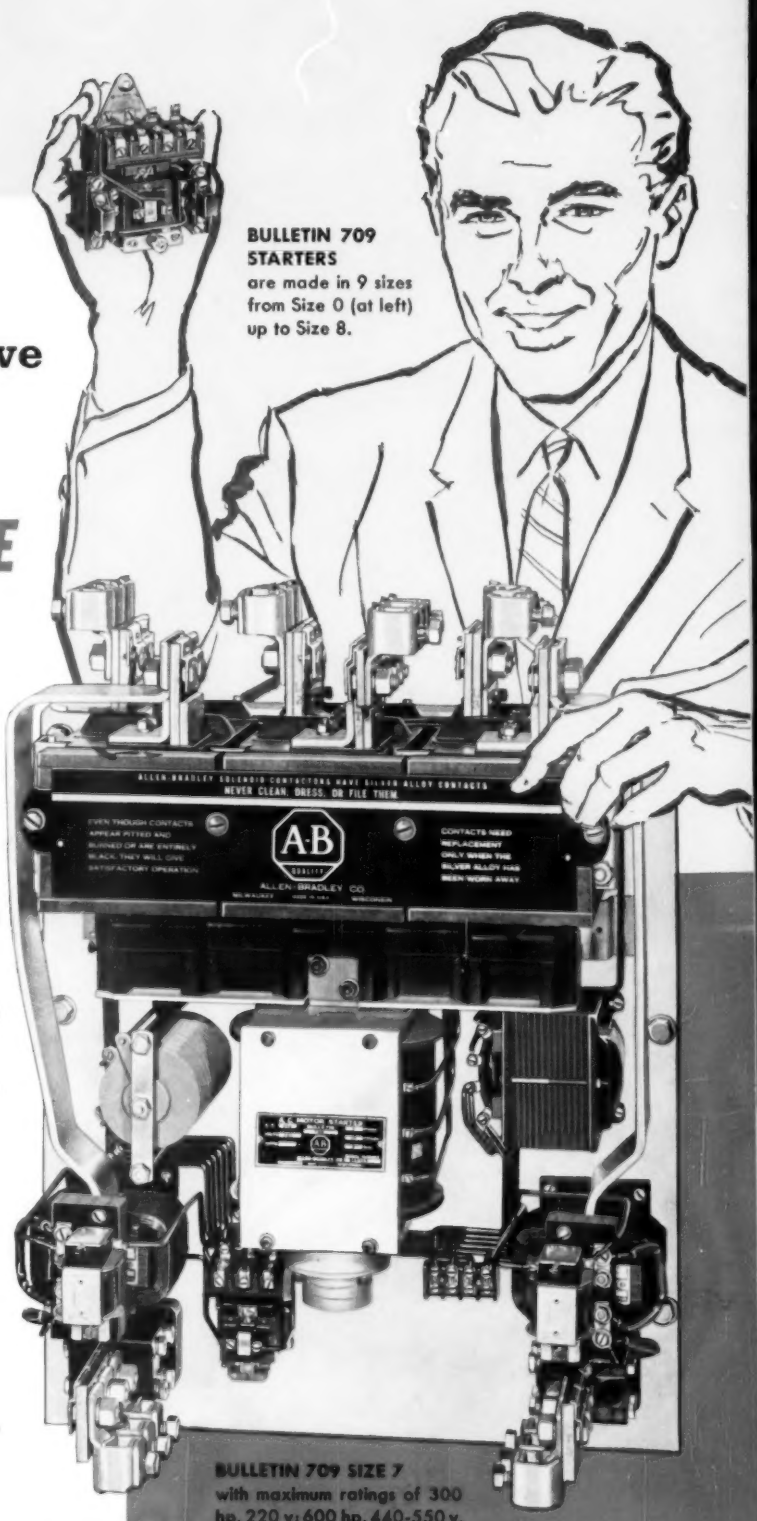

BULLETIN 709 STARTERS are made in 9 sizes from Size 0 (at left) up to Size 8.

BULLETIN 709 SIZE 7 with maximum ratings of 300 hp, 220 v; 600 hp, 440-550 v.

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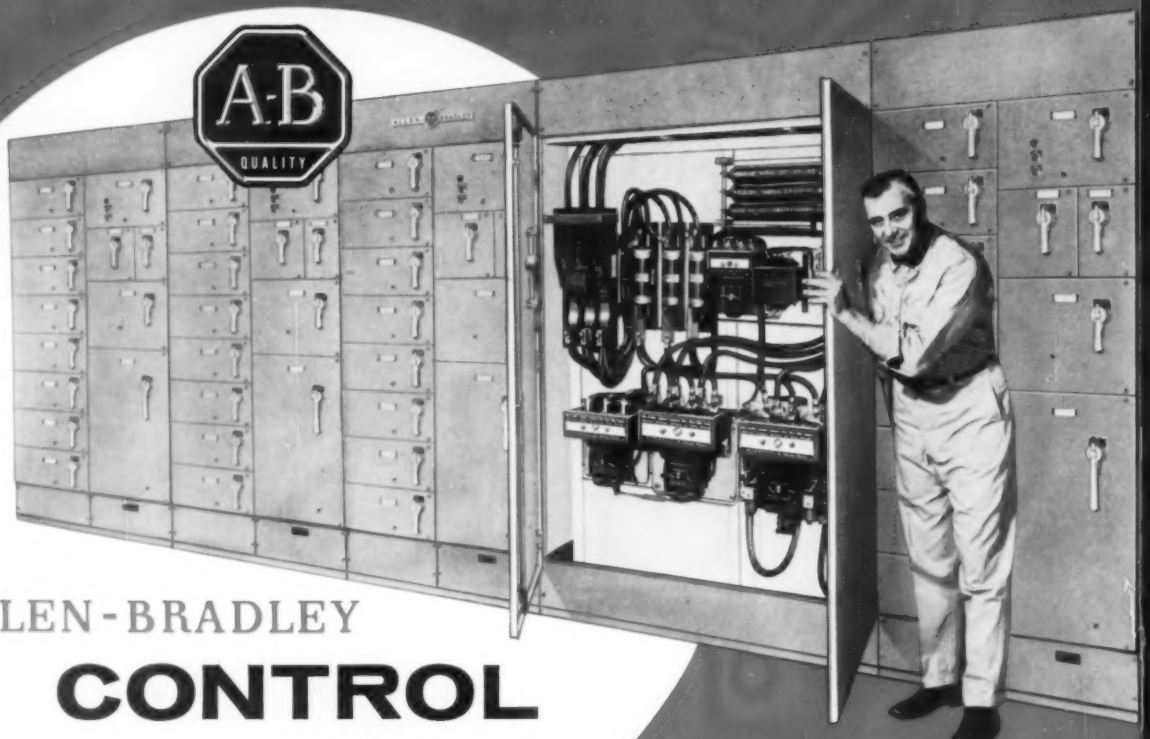

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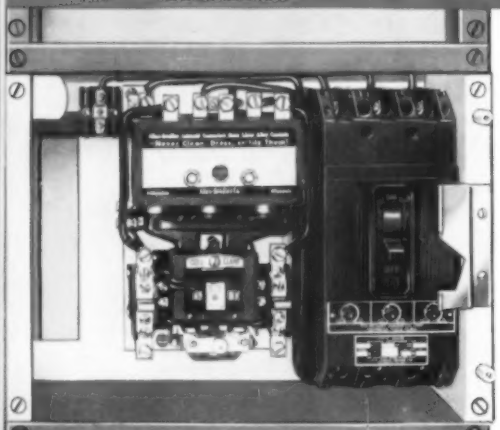

This typical unit of an A-B control center shows a Bulletin 709, Size 2 starter and an I.T.E. circuit breaker.

Allen-Bradley control centers are the "label" of a modern plant. They make neat, centralized installations and—where this is practical—do away with individual starter mountings and complicated wiring. The control center may even reduce installation cost—as compared with using individual starters. Here are some of the up-to-date design features which make the A-B control centers so popular.

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6-59-MR

QUALITY MOTOR CONTROL

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Lighting for a Plant

QUESTION X35—At the plant where I am employed, we are to light a building, size 120 *by* 200 *ft. We would like to use fluorescent lighting; approximately* 50 *footcandles are required. Should the standard type* 8*-ft fluorescent lights be used, or would it be best to use special type* 600*-volt* 840*-cycle fluorescent lights? What is the cost comparison, efficiency, maintenance and life of each type? Are high-cycle lighting systems commonly used today?—M.D.*

ANSWER TO X35—It must be recognized that there is no difference in the fluorescent lamps when operated at 60, 420 or 840 cps. The difference is in the lamp ballasts, the distribution system and the performance of the lamps themselves. The attractive features of the higher frequency systems which may be either 420 or 840 cps are that approximately 20% greater light output can be realized, consequently fewer fixtures, and the ballasts are smaller and lighter. The ballasts may either be the conventional lead-lag or a simple capacitor, but shunt connected choke coils are required to improve the power factor.

On the minus side, the added expense of a frequency conversion unit which may be an M-G set, a static frequency multiplier unit or a power transistor unit, must be considered in addition to considering the derating of current rated devices and the increase in the effect on voltage drop due to the higher frequency. Noise level at the higher frequencies is more of a problem than at 60 cycles since there are no background noises to mask the high frequency squeal.

In the example given, approximately 50 kva of lighting will be required for a level of 50 footcandles. In comparing the cost of this system, the most economical 60 cycle system should be selected which in an industrial or large commercial building may be 480Y/277 volts. Other factors besides actual cost of the electrical system should also be considered. Lower ballast losses will require lower air-conditioning load, thus permitting higher lighting levels. Reduced ballast size and weight can result in savings in supporting structure in some buildings. Higher intensity light sources mean that high-bay fluorescent lighting systems are feasible.

Overall efficiency of either system is within 2-3% maintenance, and life of the lighting system will be same regardless of frequency, but the higher frequency system has the added factor of maintenance of the conversion unit. It may not be significant, but it should be considered.

All of these factors must be evaluated for each particular installation to determine the most applicable system. Higher-frequency systems have been used advantageously in buildings such as field houses, convention halls, industrial plants, and aircraft hangars. Further information can be obtained from General Electric publication GEA-6559, High Frequency Fluorescent Lighting Systems.—D.S.B.

ANSWER TO X35—The information as supplied by M.D. is insufficient to give any specific answers, but in general, the installation and operating costs are higher than the present standard type 60-cycle systems. Expanding on this statement, it is necessary to convert the frequency from 60 cycles (assuming that this is what is available in the building now) to 840 cycles by use of a frequency converter. The frequency conversion may be effected by rotating type generators, electronic converters, magnetic type converters or vibrators. The initial cost of the installation will be materially affected by the type of converter or converters used. The size and number of converters used will be determined by the load.

The overall operating efficiency of the high frequency system (frequency converters included) is lower than the standard 60-cycle system, hence, operating costs will be higher for the 840-cycle system.

Efficiency of the lamps and ballast will be slightly higher at 840 cycles.

Maintenance on lamps, ballast and fixtures should be approximately the same for both systems. Additional maintenance would be required for the converters, the amount depending upon the type of converter. Life of the lamps, ballasts and fixtures should be approximately the same. Life of the converter depends on the type used.

High frequency systems are not in common use today primarily because of the high initial cost of the converter and its relatively low operating efficiency.—E.A.R.

Ampere Readings

QUESTION Y35—We have just completed an installation of 3*-phase* 4*-wire full neutral copper bus duct. The duct runs from basement to the* 11*th floor of an office building.*

We have discovered that you can obtain an ampere reading from the neutral bus to ground. The reading diminishes as you go down until the second floor, at which point ampere reading is approximately one-half of reading at 11*th floor. We get no reading below second floor.*

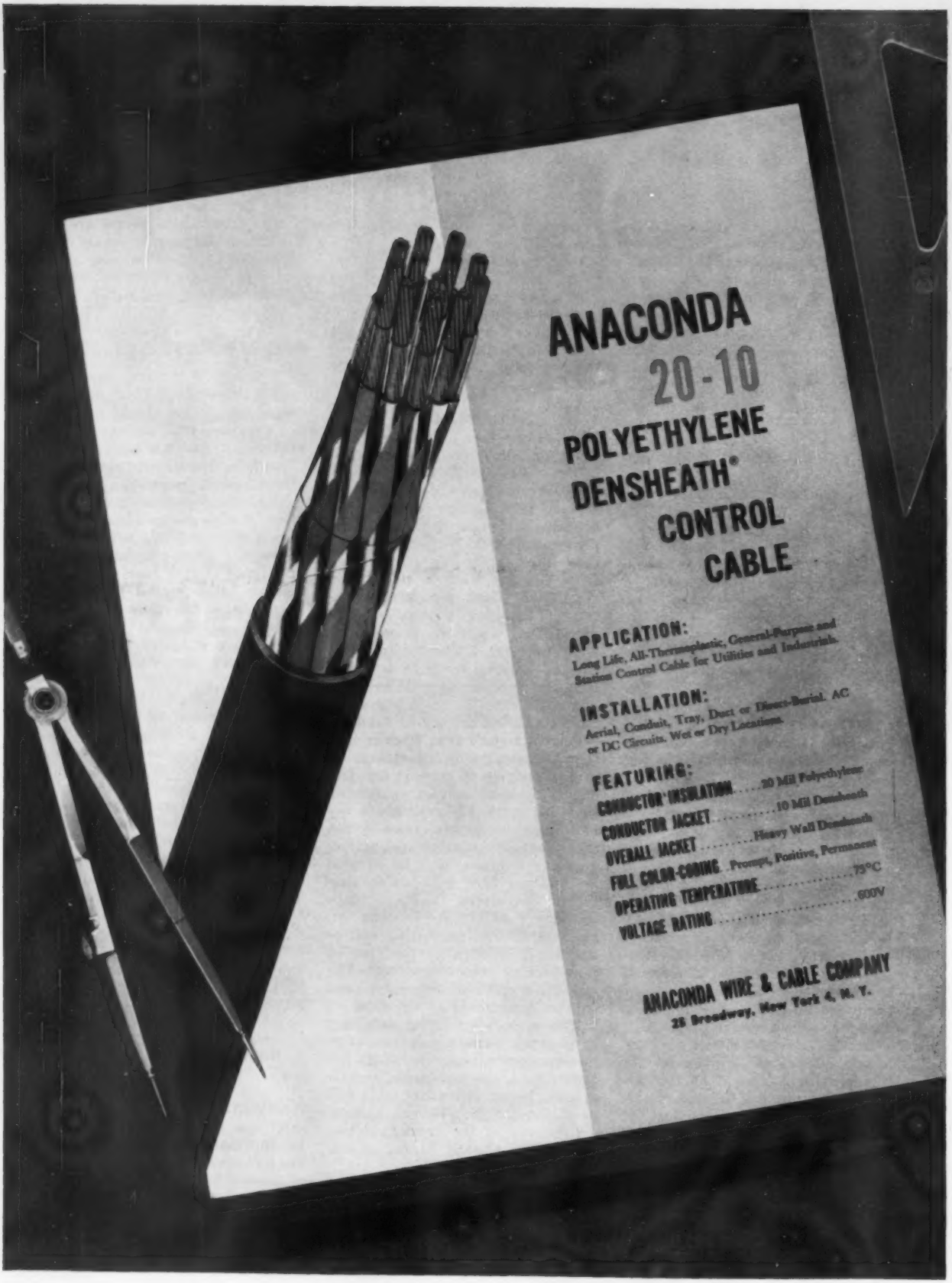
1. *What is the cause of this condition?*

2. *Should it be corrected, and if so, by what method?—W.E.S.*

ANSWER TO Y35—The ampere reading obtained between the neutral of your 3-phase, 4-wire, bus duct is probably due to the voltage drop in the neutral bus due to the unbalanced current flowing in it. Your system is probably grounded in the basement or at the first floor level. The farther from this point that the reading is taken the greater the drop will be. It is natural therefore to have the greatest reading at the top floor. There is probably nothing wrong with the electrical system, but it might be well to see if the total load is as well distributed between the three phases as possible. If the system were perfectly balanced (an almost impossible condition) there would be no current in the neutral bus.—F.C.

ANSWER TO Y35—Since W.E.S. does not give any load, ammeter readings, or copper size in the situation in question, I can only attempt to answer his question generally.

First, I must assume that the busway feeds from the basement. This would be consistent with the ammeter readings to ground decreasing as the vertical length of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Polyethylene—Densheath* (PVC) construction provides superior features, makes possible new economies and improved service through standardization.

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Anaconda 20-10 Control Cable has been designed to meet all the exacting requirements for the highest quality control cable. Each conductor is insulated with 20 mils of polyethylene, then covered with 10 mils of Densheath (PVC). This construction combines the full IPCEA recommended insulation thickness (30 mils for 600 volts) with the flame retardance, excellent color coding and abrasion-resistance of PVC.

This composite design results in a control cable that can be used in virtually all 600-volt control applications. It can be installed aerially, in conduits, trays or ducts, and directly buried.

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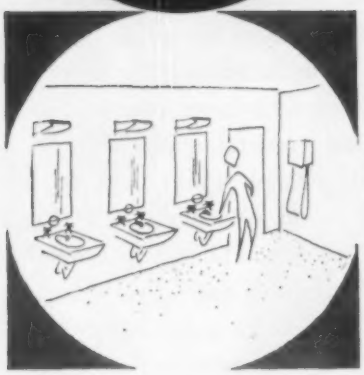

mcPhilben's new 37-60 line designed by E. Allan Rothman provides the most efficient lighting of fitting rooms, mirrors, stair landings, telephone bookstands . . . wherever localized illumination is desirable.

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37-60 Two 60 watt lamps
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the neutral bus decreases for each ammeter reading, due to neutral bus drop decreasing as readings are taken nearer the source.

The neutral bus obviously is carrying current due to either connected or electrical unbalance in the phases. If the ammeter readings are small, then this is a normal condition. If large ammeter readings are observed, the following conditions may exist.

1. Wrong neutral copper size.
2. Badly unbalanced lighting or single phase motor loads.
3. Loose bus bar joints in one or more phases.
4. Loose bus bar joint in neutral bus or service neutral.
5. Partial ground on one phase of bus and a high resistance return path to the service entrance ground.
6. High resistance fuse or loose fuse link on service-entrance switch.
7. Poor contact on main circuit breaker.
8. Trouble in utility company transformers or mains.

I would suggest the following:

1. Check phase currents for balance and compare neutral current with existing neutral bus capacity and voltage drop.
2. Check single phase loads for balanced connections to bus.
3. Check line to line voltages from floor to floor, under full load. A large difference in voltage reading will indicate a poor bus joint.
4. Inspect bus joints for "blue color" at joints, indicating heating.
5. Inspect neutral bus between wide change in ammeter readings. A loose joint may be located.
6. Check volt drop across each fuse link or circuit breaker contact under full load.
7. Check service entrance ground for resistance greater than 25 ohms, and bus enclosure for loose joint in steel. These items may prevent main fuse from blowing if ground exists on phases.
8. Check loaded voltage at service entrance for voltage balance.
9. Shut down loads at various floors and check ammeter reading after each shut-down to detect faults in loads.
10. "Megger" entire system.—E.P.

Motor Rewinding

QUESTION Z35—Is it possible to rewind a 3-phase motor for single-phase? What condition must be met for proper operation and what will be the new horsepower as a percentage of the old rating?—J.A.M.

ANSWER TO Z35—You don't have to rewind the motor unless you want top hp and efficiency, in which case you buy a Lewus relay to take the place of the centrifugal switch, and then you use a single phase winding, or you can convert the 3-phase motor by using a relay and capacitor. This will give you about 65% hp rating. By using this system on one large motor carrying no load, you can start a large number of small motors, since 3-phase motors running single phase will generate 3-phase and allow you to run other 3-phase motors at almost full power. A small 1-phase motor can be used to start the big motor, and then you can make 3-phase for other motors.—H.S.

ANSWER TO Z35—Since J.A.M. has not specified any change in speed, frequency, or terminal voltage, the simplest method, next to purchasing a 1-phase motor of suitable rating and starting characteristics, is to reconnect the motor by identifying and separating the 3-phase windings and using any two as the main winding while the third is used as the starting winding. The 2-phase windings may be properly connected in series or in parallel depending on which connection keeps the voltage per turn within the permissible limits of plus or minus 10% on the 1-phase supply. It must be borne in mind that the proper voltage for two of the 120-volt phase windings in series across 1-phase is 240 volts and in series-tie across a 3-phase supply is 208 volts.

In the 1-phase regrouping of equal number of poles, if all of the coils had been used in series across the proper voltage, the rating of the 1-phase motor thus reconnected would be reduced to about two-thirds of its 3-phase rating. However, using one of the phase windings as the starting winding causes an increase in the average distribution factor of the remaining 2-phase windings which are used as the running winding. While the generated voltage will thus be somewhat reduced by the amount of copper used, the heat loss will also be reduced to two-thirds. This favorable development will allow an increase of about 10% in current and voltage ratings of the main winding, so that the power rating of the motor will not suffer much as a result of the 3-phase to 1-phase change. The efficiency, power factor, and torque will probably be lower on 1-phase. The application of about 10% higher than rated voltage or cutting out the corresponding number

Tiny neon locator light built into GE5481-2 lighted push-button switch shines in the dark.

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You get a modern, push-type button that fits standard toggle-switch plates; is easy to operate; even works with an elbow, when hands are full. The built-in neon locator light shines in the dark — also acts as a low-cost pilot indicator to show when unseen lights are OFF. It operates for less than **1¢ a year** — lasts up to 20 years.

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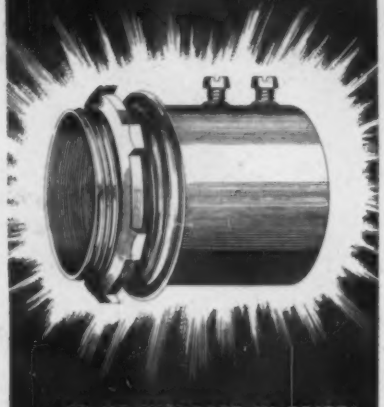

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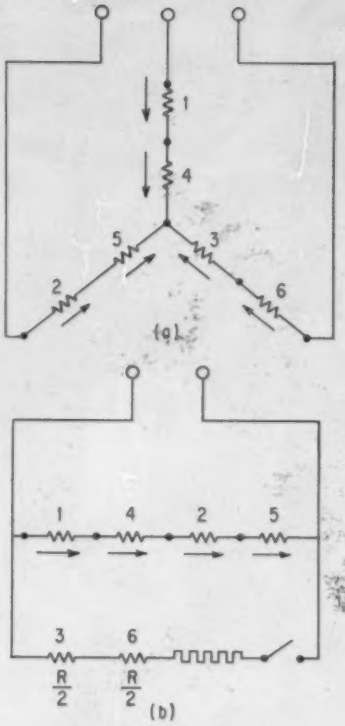

(a) The six pole-phase groups of a 2-pole, 3-phase motor.
(b) Pole-phase groups of Fig. a reconnected for single-phase operation. The resistor must have an ohmic value about three times that of the phase-winding. S may be a manual or centrifugal switch.

of turns to bring about the same effect improves somewhat the characteristics of the reconnected 1-phase motor.

In a split-phase, 1-phase motor, a good ratio of starting to running winding resistance is 1.6 to 3. The required additional resistance of suitable carrying capacity can be added externally. A good ratio of starting to running winding reactance is 0.5 to 0.8. These two conditions can be easily realized by the suggested reconnection.

The external resistor of 3R giving a starting winding circuit resistance of 4R as compared with 2R of the main winding is shown with the required centrifugal switch for opening the starting circuit after the motor reaches about 70% of full speed.—R.G.C.

Voltage Rating of Choke Coil

QUESTION A36—What determines the voltage rating of choke coils on lightning arresters?—G.J.P.

ANSWER TO A36—The voltage rating of a grounding reactor should be equal to the line-to-neutral voltage. The voltage rating of a lightning arrester represents the maximum voltage at which it will interrupt follow-through current after a surge sparkover.—W.R.S.

ANSWER TO A36—The voltage rating of a choke coil used with lightning arrester has in general no reference to the coil, but to the insulators on which the coils are mounted. A coil designed for 100 amps would be practically the same whether used on a 11,000-volt circuit or 3,000 volts, but the insulators for the 33,000-volt coil would have to be designed to withstand three times the voltage of the 11,000-volt coil.

From a protective standpoint, the 33,000-volt coil would be perfectly satisfactory on a 6,600-volt circuit, but from the commercial side the cost of the insulator would be necessarily high.—G.J.O.

Induction Motors

QUESTION B36—Which type of capacitor connection at the load, series or parallel, is better for power factor correction of ac induction motors and why?—W.E.G.

ANSWER TO B36—Capacitors are condensers of relatively large value of capacity and are used on power distribution systems or in industrial plants to improve power factors. They are connected directly across the line and tend to neutralize the effect of lagging power-factor loads (which in turn are generally caused by under-loaded motors) which cause heating of conductors. The above condition is sometimes referred to as wattless power, because this power must be supplied from power source but performs no useful purpose such as energy.

The amount of reactive kilovolt-amperes capacity required to raise the power factor to any desired value can be determined from any good engineering handbook, or from the manufacture of capacitors, and is called KVAR. In the past the practice has been to place capacitors of large value across the line at distribution panels, etc. However, the present trend is to place capacitors of smaller sizes directly at loads; this has proven to be a more effective method of correction. Of course the cost of installation must be considered when contemplating either method.—C.L.

ANSWER TO B36—The more desirable capacitor connection for the

General Electric interchangeable 20-amp a-c switch, outlet and pilot light mount firmly with simple twist of double-hooks.

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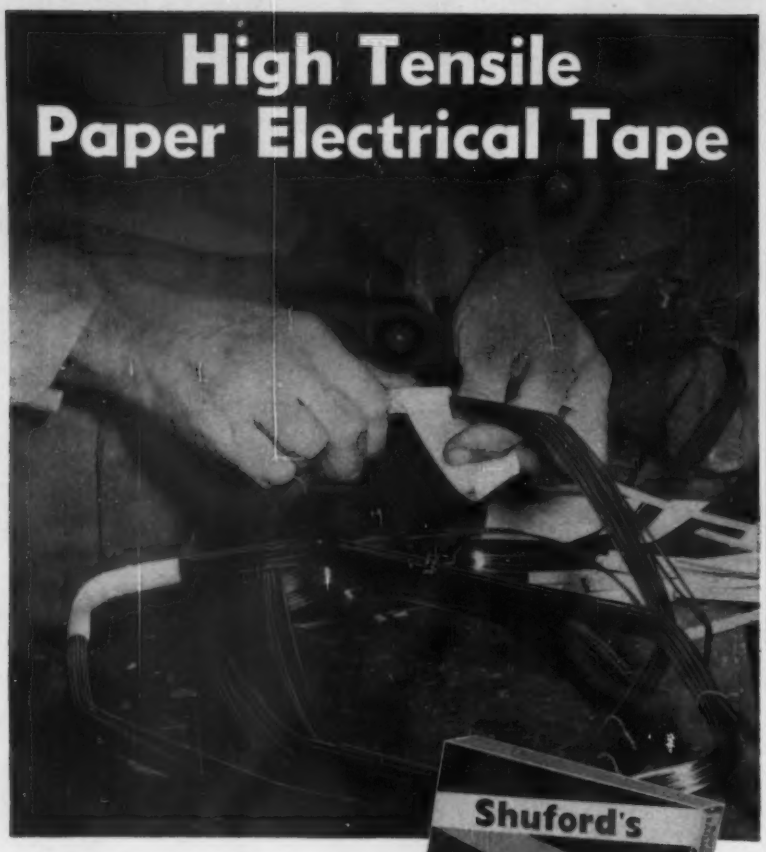

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improving of power factor of ac induction motors is the shunt connection. The capacitor should be placed on the load side of the motor-starting device as this location guarantees that the protection will be there when it is needed. If possible, on existing installations, the capacitor should be placed between the contacts and the motor overload protector, as this location does not necessitate changing the protector.

Series capacitors, if used, bring about a voltage increase across the capacitor itself, which varies with the load or motor current. While this is good in the sense of system regulation, it means that for power factor correction of a varying load the capacitor should be variable.

Series capacitors may lead to the self-excitation of the larger motors.

The most obvious reason for not using series capacitor is one involving the difficulty in engineering to determine the correct capacitor for the situation. While in the shunt connection the correct value is either picked from a table or by the rule of thumb, that the capacitor current should not exceed the motor no-load current.—J.W.M.

Can You Answer These QUESTIONS?

QUESTION K36—What is the approximate rule for the minimum distance between pulley centers for open belt drives from small electric motors?—G.J.P.

QUESTION L36—We plan to install a heavy flywheel between motor and generator of traction system to smooth out peaks. Being a dc load we have no problem with variation in frequency, only voltage. The sags are produced by heavy coal trains starting in mine grades. Is the following the proper equation to use to solve the problem?

$$WR^2 = \frac{\frac{130\ KW\ Z}{(rpm)\ 3}}{100} \times \frac{A^2}{A^1}$$

—T.H.A.

QUESTION N36—The N.E. Code allows threaded electrical metallic tubing for wiring in a Class 1, Div. 2, hazardous area, provided it complies with Section 3487 of the Code.

Has any reader used threaded EMT, and what company makes threaders and fittings?—W.E.G.

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Links connecting line terminals on GE4065-2 Grounding Outlet are easily removed with a screwdriver to permit separate feed.

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Questions on the Code

Answered by:

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Sealing, Class II, Div. 1 and 2 Locations

Q. *Referring to Article 500, Section 5055 entitled "Sealing, Class II, Div. 1 and 2, one can see that this section does not make mention of raceways leaving Class II, Div. 1 and 2 areas and going into non-hazardous areas. So I am concluding that, "A", no matter where there is a raceway less than 10 ft horizontally between a required dust-ignition-proof enclosure and one which is not, even though the non-dust-ignition-proof enclosure is in a non-hazardous area, I need an effective seal.*

I am also concluding that, "B", if I have a non-dust-ignition-proof enclosure in the Class II, Div. 1 or 2 areas leaving in a raceway, which is less than 10 ft horizontally and going to an arc making device in a non-hazardous area, I do not need a seal.

I do not see the reason or logic for these requirements because I think that in Example "A" the seal is not required and in Example "B" the seal is needed.

Therefore, I am wondering if I am interpreting the code properly or is it to be implied that the paragraph on sealing is only to cover enclosures within Class II, Div. 1 and 2 areas and since no mention is made regarding leaving the Class II area that no seal is required for Example "A" or "B"?—A.J.H.

A. The provisions of Section 5055 of the code read as follows: "Sealing, Class II, Div. 1 and 2. Where a raceway provides communication between an enclosure which is required to be dust-ignition-proof and one which is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignition-proof enclosure through the raceway. This means may be (1) a permanent and effective seal, (2) a horizontal section not less than 10 ft long in the raceway, or (3) a vertical section of raceway not less than 5 ft long and extending downward from the dust-tight enclosure."

This rule first appeared in the 1946 code, and it is significant to note that it applies to only one condition, namely "Where a raceway provides communication between an enclosure which is required to be dust-ignition-proof and one which is not." The occasion for the rule is to prevent the entrance of dust into the dust-ignition-proof enclosure through the raceway. There is no provision which requires a seal to be installed where the raceway leaves the Class II, Div. 1 and 2 location and enters a non-hazardous area, and I am unable to visualize the necessity for a seal at that point for the following reasons:

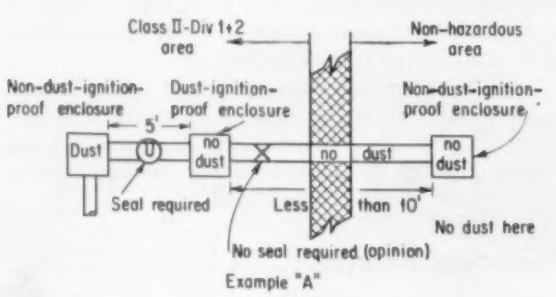
As shown by Example "A", we have a dust-ignition-proof enclosure in the hazardous area, which is served through rigid conduit or EMT as covered by Section 5054. This run of conduit includes fittings such as boxes, condulets or unilets which are not dust-ignition-proof. In order to prevent the dust which may enter the conduit system through such fittings or enclosures, and then travelling to the dust-ignition-proof enclosure a seal must be installed, or the alternate procedure covered by Section 5055 must be followed. The conduit which leaves the dust-ignition-proof enclosure, and runs direct to a non-dust-ignition-proof enclosure which is located outside the hazardous area needs no seal since there is no dust problem in the non-hazardous area. There is no place in this conduit run where dust could enter the conduit system. In view of the foregoing, there is no occasion to install a seal at the point "X" marked on Example "A".

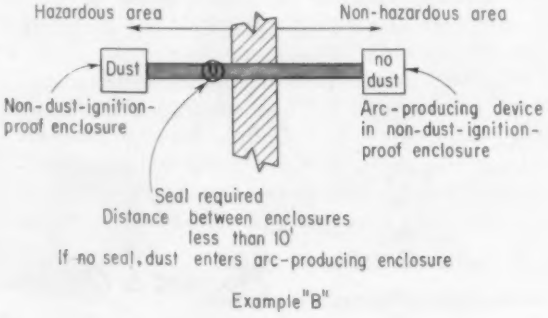
In connection with Example "B", the conduit leaves an enclosure which is not dust-ignition-proof located in the hazardous area, and runs horizontally through a wall to an arc producing device located in an enclosure in a non-hazardous area. In this case, dust may enter the enclosure in the hazardous area, and when the horizontal distance is less than 10 ft, travel to the enclosure containing an arc producing device located in the non-hazardous area. Under such conditions we may expect to obtain an ignition of the dust. In order to avoid such an occasion a seal should be placed in this conduit run.

It appears that the foregoing concept of this code rule coincides with your comment. Assuming the logic involved is correct, it would be very helpful to the various men in the field who occasionally apply these rules, if the status of conduit which enters or leaves the hazardous area was more clearly established.—B.A.McD.—6/59/1

Disconnect for Pump Island

Q. *On a dispensing pump with a 220-volt motor and a light on top of the pump, we have two ungrounded conductors and a neutral in a raceway entering the dispensing pump. Would the code require a 3-pole disconnect to break the two ungrounded and one neutral conductor simultaneously?—C.T.*





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A. Yes. Section 5120e requires ". . . a switch or other acceptable means to disconnect simultaneously all conductors of the circuit from the other source of supply."—B.Z.S.—6/59/2

Separate Circuits to Pump Island

Q. *Would the code allow the pump motor to be connected on one circuit and the pump lights to be connected on a second circuit on the pump island? If so what would be the requirements for a disconnect?—C.T.*

A. Yes. Since each circuit feeds a different load on the pump island, viz., one circuit feeds the pump and the second circuit feeds the lights, two disconnects would be used. Each disconnect would be required to disconnect simultaneously all conductors of each circuit from the source of supply as required by Section 5120e.—B.Z.S.—6/59/3

Armored Cable—Factories

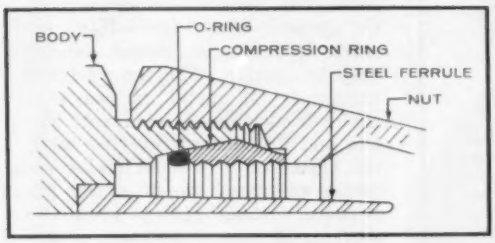
Q. *Is it good practice to use armored cable for power runs in a factory? The chief electrician has on several occasions used 3-wire No. 12 armored cable for a power run to machine carrying 440 volts 3-phase power. I have always been of the opinion that armored cable is for house wiring.—J.A.J.*

A. According to the provisions of Section 3342 of the code, armored cable (Type AC or ACT) commonly known to many by a famous trade name BX, is approved for use at 600 volts or less, and may be used for both exposed and concealed work in dry locations. While this section of the code does not deny the use of armored cable in a factory, provided it is not considered a hazardous location, there are several other types of occupancies and applications where it is not considered to be an appropriate wiring method. Sections 3344, 3345 and 3346 recognize the fact that protection of armored cable from mechanical injury is a factor of importance.

A factory is defined as a building or buildings equipped to manufacture. This covers a broad range of operations which could vary from an area devoted to the hand assembly of small parts to area fully mechanized by electrically driven ma-

2½", 3" and 4" sizes

NEW IDEAL SIMPLET VAP-OIL-TITE CONNECTORS



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chinery. As a result, the severity of the mechanical injury to which armored cable may be subjected varies with the nature of the manufacturing process. It therefore becomes the responsibility of the inspector and the electrician to decide just where armored cable may be used in a factory without violating the general rules of the code. Many variable factors are involved and it would be impracticable for the code to cover in detail the various conditions of operation which would prohibit or recognize the use of armored cable. There are, however, many types of factories where armored cable could not, in my opinion, be used and satisfy minimum code requirements. In an average factory what do we find? Attached to the ceiling we may have water and gas pipes, sprinkler pipes, steam pipes, air pipes, and amid this maze of facilities, foreign to our electrical system, we have electrical fixtures, electrical circuits feeding motors, heaters, etc. All of the foreign systems are in pipe and must be maintained by mechanics of other trades who may not fully realize the hazards presented by the electrical system. Under such conditions it would, in my opinion, be folly to install armored cable.

Another factor to be considered in the case under discussion concerns the 440-volt power circuit. On systems where the voltage exceeds 250 volts to ground, as covered by Section 2575, the electrical continuity of metal raceways or cables is considered important. The life and fire hazard involved when the frame of a 440-volt motor becomes energized due to a low impedance, or open path to ground is serious. A loose connector, or one from which the cable has been accidentally torn could leave a motor frame ungrounded. Vibration, common to many factories, could be the occasion for an open or poor grounding circuit for a motor frame.

A summary of the foregoing prompts me to express the personal opinion that it is not good practice to serve 440-volt power loads with armored cable in a factory occupancy, and I know from past experience that many of our electrical designers, who have the responsibility for deciding the degree of safeguard essential for an occupancy, share this opinion. Treading the thin line of minimum code requirements, may not promote an installation essentially free from hazard unless a factor of safety is applied when making an interpretation.—B.A.McD.—6/59/4

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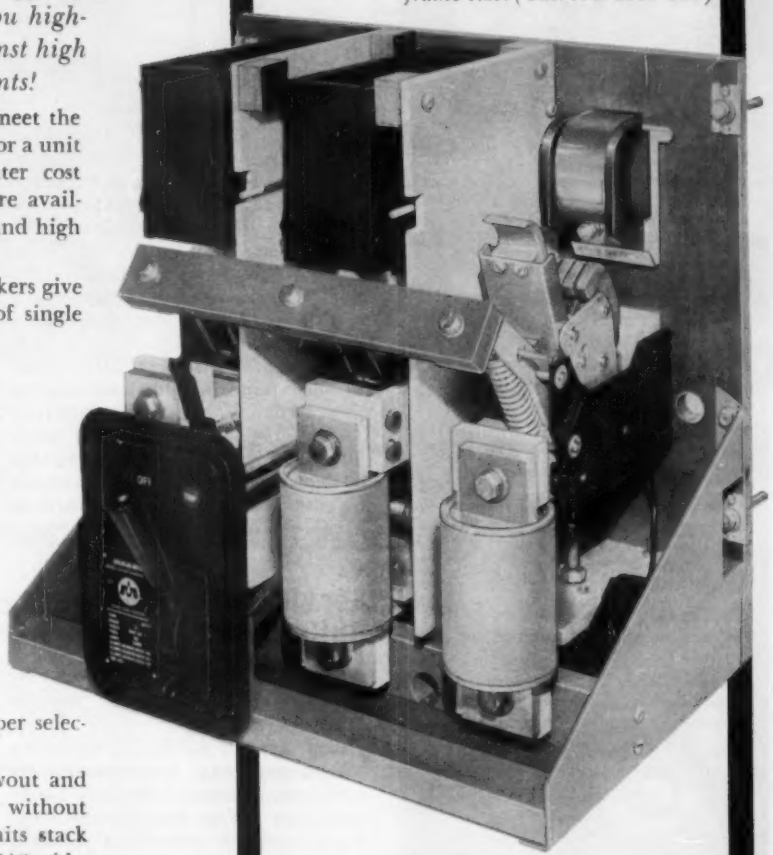

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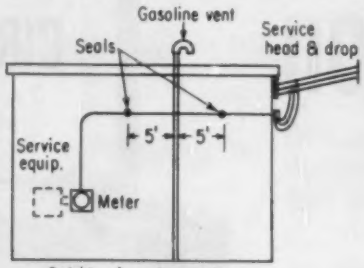
Tank Vent Pipe Hazardous Area

Q. *Is it correct to understand that the new Section 514-2-b (5120b2) would require seals in the service entrance raceway or other raceways run on the outside of the building where they would pass through the 5-ft radius area mentioned in this section?—C.L.F.*



Outside of service station

A. Yes. This new material to be added to present Section 5120b2 (new 514-2b) creates a new Class I, Div. 2 hazardous area around each vent pipe. This area, as shown, extends 5 ft horizontally in all directions from the upper end of the vent pipe and downwards to the ground level.

Present Section 5120f2 (new 514-6b) requires additional sealing in accordance with Sections 5015a2 (new 501-5a3) and 5015b2 (new 501-5b2). This latter section 5015a2 covers sealing of raceways leaving Class I, Div. 2 hazardous areas.—B.Z.S.

Service Equipment Pullout Interchange

Q. *Is it permissible to make six circuits out of the regular 4-circuit main and range double pullout service switch by replacing the 60-amp range fuse holder with a 30-amp to meet N.E. Code 2461b and then using 15-amp cartridge fuses to feed two extra lighting circuits?*

The bad part of this is, that if the owner adds equipment at a later date all kinds of violations take place if the switch is not replaced. —E.F.

A. If the service equipment in question is labelled by Underwriters' Laboratories, and the design permits the use of a 30-amp fusible pullout type of switch in place of the 60-amp pullout, I don't believe there is any code violation involved. In other words the 50-amp circuit, provided for a range, could

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Two ½" and two ¾" K O's in sides and three ½" and two ¾" K O's in bottom.

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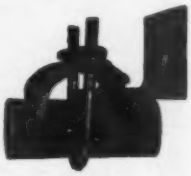

This clamp is made of malleable iron, cadmium plated to prevent rust and has a safety bite of case hardened tool steel. Two models—right angle and parallel—each in 10 sizes to handle pipe or conduit ½" thru 4".

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There are four basic reasons every Okonite cable—simple or complex—pays off with assurance of extra "staying power" in your vital circuits.

1. **Engineering experience** assures constructions that are designed from conductor out to give longer life in each specific type of application.
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3. **Manufacturing skill** in all known insulating methods, developed over 80 years, combines with the most modern equipment and controls to give the **right** cable for your circuit.
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800 to 3000 Watt

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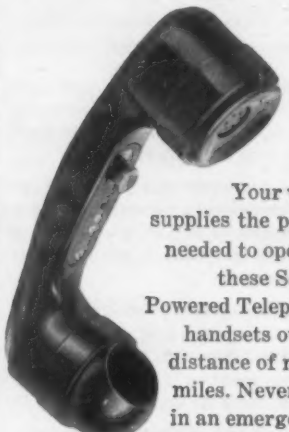

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be used as a 30-amp circuit for a water heater, or a dryer or similar loads within its 30-amp capacity. It also could be used to provide two additional 15-amp branch circuits as described in your question.

It is significant to note, in connection with this opinion, that while the 30-amp fusible pullout switch may be inserted in the 60-amp block, the 60-amp fusible pullout switch cannot be inserted in the 30-amp block. This design feature satisfies the provisions of Section 2461b. It appears to me, when service equipment, labelled by UL, is so designed to permit the interchange of a 30-amp pullout as described, there would be no code violation.

Your observation with respect to future loads is quite pertinent. While the procedure outlined may offer immediate advantage to the owner as a temporary expedient, past experience indicates that a bottleneck for future loads exists which may only be eliminated by the installation of larger service entrance conductors and equipment.—B.A.McD.—6/59/6

Aluminum Service Cable

Q. *Is there an approved neoprene aluminum service entrance cable and a neoprene covered direct burial aluminum service entrance cable?—H.R.*

A. Yes. Underwriters' Laboratories Inc. lists the cables of several manufacturers of such service cables.—B.Z.S.—6/59/7

Fluorescent Lamps—20-Amp Circuits

Q. *Can the high output, very high output and power groove fluorescent lamps be applied on greater than 20-amp branch circuits? What is the classification of the recessed double contact lampholders for these lamps — medium, admedium or mogul? Can the ballasts for these lamps be applied at greater than 20 amps?—B.C.M.*

A. The provisions of Section 2126-b cover the various loads which are permitted to be installed on a 30-amp branch circuit. It reads as follows:

"2126-b. 30-Amp Branch Circuits. Fixed lighting units in other

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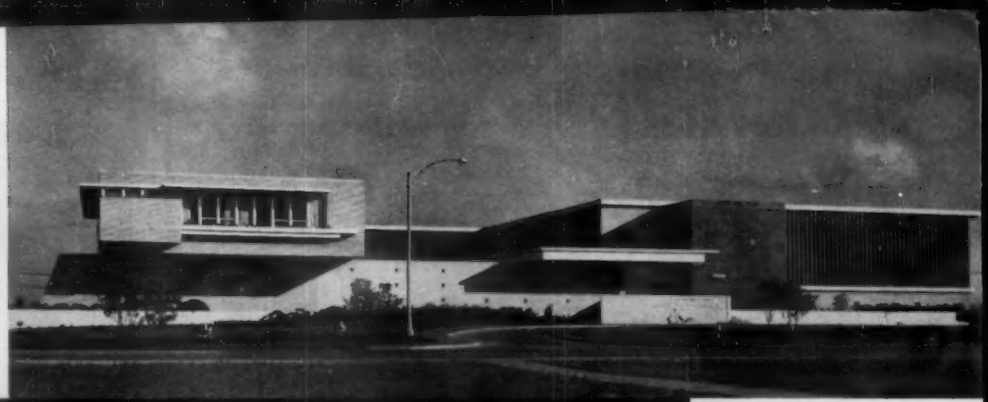

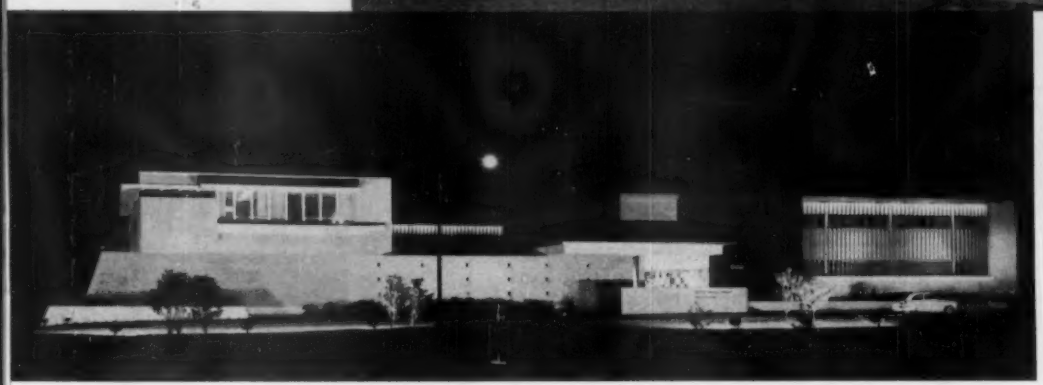

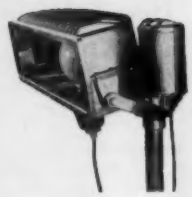

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than dwelling occupancies; or appliances in any occupancy. The rating of any one portable appliance shall not exceed 24 amps."

This 1956 code rule is the same as appeared in the 1953 code. During June of 1955 an Official Interpretation, No. 420, was issued as follows:

"Section 2126-b; Lighting Fixtures on 30-Amp Branch Circuits.

"QUESTION—In industrial and commercial occupancies is it permissible to install fluorescent lighting fixtures on 30-amp branch circuits under the provisions of paragraph b of Section 2126?

"ANSWER—No. See also 2123-a, 2114, 2127 and 94103."

Section 2123-a requires a lampholder, connected to a circuit rated over 20 amps, to be of the heavy-duty type.

Section 2114 defines a heavy-duty lampholder as one rated at not less than 750 watts, and also advises that the lampholders listed in Section 94106 (fluorescent lampholders) shall not be considered as heavy-duty lampholders.

Section 94103 concerns the bases used with incandescent lamps, hence it is not involved in the problem.

Section 2127 covers a summary of the various provisions of Article 210 in the form of a table. Reference to this table indicates that only heavy duty lampholders may be placed on a 30-amp branch circuit.

In view of the foregoing code requirements, it appears that the very high output and power groove fluorescent lamps cannot be connected to a circuit rated at more than 20 amps, and the same reasoning applies to the ballasts which serves such lamps.

The classification of electric discharge lampholders, such as used with fluorescent lamps, is covered by Section 94106. Such lampholders are classified according to the dimensions and spacings of the pins in the lamp bases as covered by the table. Classification in terms of admedium, medium, mogul, etc., only apply to screw-shell lampholders which may be verified by reference to Section 94102-d.

In the interest of clarifying the provisions of Section 2126-b and c, it is significant to note that a proposal for a revision of the 1956 code has been accepted by Panel No. 2. This revision would change the present wording of Sections 2126-b and c as follows:

"Fixed lighting units (with heavy duty lampholders) in other than dwelling occupancies". The words in brackets are new. — B.A.McD.—6/59/8

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Appliance Demand Factors

Q. *How should you figure demand for clothes dryers in apartments? Also air conditioning units*—B.R.

A. As far as electric clothes dryers are concerned the code at present does recognize a demand factor. Section 2203e permits a 75% demand factor where four or more fixed appliances, other than electric ranges, air conditioning equipment or space heating equipment, are installed.

Actually a clothes dryer as a single unit does not have any diversity of use as is to be found in an electric range. A clothes dryer when it is in operation is operating at full rating. It is reasonable to assume that as more clothes dryers are added to one particular feeder system as in the case of an apartment house occupancy, there will be some diversity of use. Therefore, the 75% demand factor may be used if four or more such units are involved.

It is interesting to note that the proposed amendments of the 1956 NEC for incorporation in the 1959 code includes a new recommendation showing a new table of demand factors similar to Table 29 in the 1956 code. This table will be entitled "Demand Factors for Electric Clothes Dryers" and is intended to be used if Section 2203e is not used. It will give much more liberal demand factors than this 75% factor of Section 2203e so it is expected that if the table is approved it will more or less supersede Section 2203e as far as clothes dryers are concerned.

For example, one to four dryers will have a 100% demand factor, five dryers an 80% factor, six dryers a 70% factor and so on down a sliding scale to ten dryers where a 50% demand factor may be used. Then follows six groups with a smaller demand factor and finally a 25% demand factor if 40 or more clothes dryers are to be considered on a single main feeder.

As far as the air conditioning load is concerned no data has been presented as yet to indicate the advisability of using a demand factor. Seemingly no appreciable diversity has been found where air conditioning is used in apartment buildings. It is logical to assume that weather conditions would likely cause all units to be used simultaneously.—B.Z.S.—6/59/9

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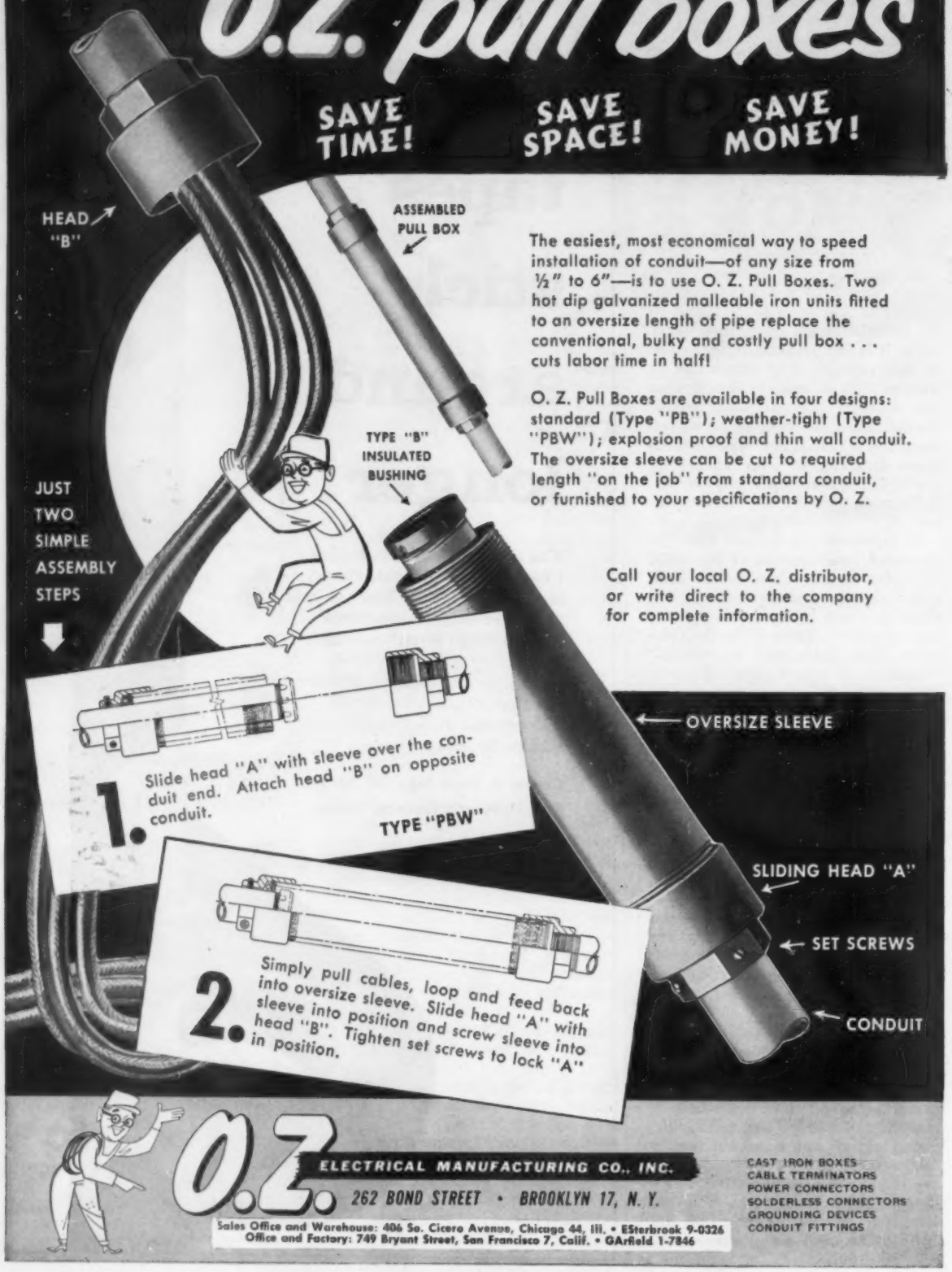
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NALMCO Holds Annual Conference in Denver

The National Association of Lighting Maintenance Contractors held its sixth annual meeting in Denver, Colo., April 27-29 at the Cosmopolitan Hotel, with a registered attendance of more than 60 members and guests from across the country and Canada. Program for the three-day meeting included a series of regular Association business meetings, guest speakers on informative lighting maintenance and other subjects, member speakers who covered various maintenance and selling techniques, etc., social and recreational activities, and a banquet at the famous El Rancho Inn in the nearby mountains of Colorado.

A highlight of the business sessions was a report by Edward I. Creed, C&S Lighting Maintenance Co., Cleveland, chairman of the Membership Committee, who stated that membership had more than doubled during the past year. Ohio leads the country with seven NALMCO members and one sustaining member, he reported, while Florida and Pennsylvania have five members each. The Association now has members in 24 states and Canada, and the membership is still growing.

Two members, William Corbett of Outdoor Lighting Service, Concord, Cal., and Barney Roth of the Barney Roth Company, Philadelphia, Pa. each gave a detailed discussion on how they sell and service outdoor lighting. These talks related to gasoline service station lighting, primarily. The major problem here is that the oil companies want and expect the lighting systems to be maintained and kept at maximum efficiency, but in general the individual stations are operated by individuals on a franchise basis, and the large number of individual operators have to be contacted and sold, according to the speakers.

An innovation was a recorded pitch on "How I Sell Lighting Maintenance," in which NALMCO President Glenn Shotola does the "selling" to a tough prospect, NALMCO member Elmo Irwin. Also of interest was a slide-and-talk demonstration of "How Fluorescent Maintenanc , Denver, Sells Lighting Maintenance", which is in regular use by Fluorescent Maintenance Co. to present the lighting maintenance story to various groups of merchants and business associations.

NALMCO officers Glenn Shotola (right), President, and Robert E. Watson (left), Treasurer, were presented plaques by Barney Roth, Director, in appreciation of their outstanding devotion and contributions to the association during the 1958-59 fiscal year, during the recent annual meeting of the National Association of Lighting Maintenance Contractors, held in Denver, Colo., April 27-29. Watson is with Fluorescent Maintenance Co., Denver, Roth is with Barney Roth Co., Philadelphia, and Shotola is with Lighting Service Co., Milwaukee.

A movie film was used to show the washing techniques and equipment used by member Malger Gray of Fluorescent Service, Inc., Tampa, Fla.

A talk on "How to Pick and Train a Salesman" was given by guest speaker Arden B. Olson, Associate Dean and Professor of the Graduate School of Marketing, Denver University. Dean Olson gave a list of the attributes of a good salesman, and then discussed some of the interview and questionnaire form techniques now in use which are devised to reveal and measure these attributes.

Representatives of three major light source manufacturers—General Electric Co., Sylvania Electric Products Inc., and Westinghouse Electric Corp.—gave informative talks on recent light source developments, lighting maintenance methods and data, and discussed ways and means of promoting lighting maintenance service by contract, including promotional aids which are available.

Jim Mattoon and Don Phillips, of General Electric Lamp Department, Nela Park, gave a chart-illustrated talk with a double purpose: 1) to present their own story to the NALMCO group; and 2) to guide the lighting maintenance service group in selling their own services. More emphasis should be put on planning, they said, and enumerated these points: A. Analyze your area —type of customers, types of promotion, your own objectives; B. Work up active prospect list; C. Use your prospect file; D. Establish balanced pattern of calls; E. Make sure you understand your customer; F. Make sure you understand your product and its application. Then MEASURE your results —review what you have been doing, and where you are going, they urged.

As part of this presentation a "comparator" light box was demonstrated which has been developed for use in selling lighting maintenance service, or better lighting, as the case may be. Other available aids were described and discussed, such as color slide kits and comments for a wide variety of lighting subjects, new light sources were described, etc.

Notice was made of the growth in attendance at the NALMCO meetings, of the Association's determination to grow in size and stature, and the hope was expressed that NALMCO would consider hiring a professional publicity agent to further aid in the promotion of the lighting maintenance service business.

L. P. Pleasants and Leo Duvall of Sylvania Electric Products Inc. discussed "The Silent Prospect," in which the results of a survey of industrial plant engineers and management were presented and discussed. The survey covered a series of questions which were asked of these "silent" prospects, and typical replies which were made by the prospects. The survey indicated that no two industrial plants or individuals had the same answers, or even think the same way, Mr. Pleasants stated. But of all the persons interviewed, he said, not one indicated cost as a factor preventing the use of lighting maintenance contractors to do lighting maintenance work.

Mr. Duvall discussed product developments which will affect lighting maintenance contractors.

Tom S. Madonia of Westinghouse Lamp Division discussed lumen depreciation of the various types of light sources, and made the point that the newer fluorescent and mercury vapor lamps maintain their efficiency longer—burn out more

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closely together. He also discussed lamp life versus burning cycles, lamp life versus light output and other light source data and factors related to the problem of lighting maintenance. The various "colors" of white fluorescent lamps were discussed, and the "cool white" lamp was described as being closest to having a balanced color spectrum. It was estimated that by 1963 the 1500 ma (very high output) lamps would constitute 10% of the fluorescent lighting market, and it was stated that a 3000 ma lamp would be desirable—may possibly be developed.

New officers elected for the next (1959-60) fiscal year were as follows: President—Melvin H. Galbraith, Approved Lighting Service, Cedar Rapids, Iowa; Secretary—Malger H. Gray, Fluorescent Service, Inc., Tampa, Fla; Treasurer—Ken Purington, Lighting Sales & Service, Davenport, Iowa; Editor, "The Mainlighter"—Glenn Shotola, Lighting Service Co., Milwaukee, Wis. Regional Vice-presidents are as follows: Eastern—Henry Wilser, Poughkeepsie, N. Y.; Southern—Pat W. Bordelon, New Orleans, La; Central—Jerome Gimbel, Chicago, Ill; Midwestern—R. J. Peters, Topeka, Kansas; and Western—Robert E. Watson, Denver.

IES Regional Conferences Held

The 1959 series of Regional Conferences of the Illuminating Engineering Society got under way this spring when the Society's East Central Region held a two-day session in Baltimore, Md. on April 9-10. In attendance were some 100 members and guests, from the Region's six Sections located in Virginia, District of Columbia, Maryland, Delaware and Pennsylvania, and including lamp and lighting equipment engineers and salesmen, electric utility lighting engineers, government engineers and scientists, consulting electrical engineers, architects, electrical contractors, and others.

Theme for the Baltimore conference was "Application of New IES Research," or more specifically, the application of the new recommended lighting levels developed and approved by the Illuminating Engineering Society during 1958, based on past light and vision research work and the 1958 report covering an eight-year study of light and vision by Dr. H. Richard Blackwell. The Blackwell studies provided a scientific basis for the determination of lighting levels required for seeing tasks, which was used in the development of the Society's new Recommended Footcandle Levels tables.

Featured speaker at the first day's luncheon was George J. Taylor, IES President. In support of the conference theme, he reported that new scientific knowledge about the amount of light the human eye requires for effective seeing already is bringing important benefits to employers and workers in industry throughout the nation. Among case histories cited in support of this contention were a California aircraft factory which increased its lighting eight-fold, found that the number of rejects in a day's production was suddenly reduced from 28 to three, and that this increased production efficiency resulted in saving the factory $2500 a day; also, an Ohio machine shop, where lighting was increased four-fold, resulting in an immediate production increase and a decrease of 28% in rejects.

Mr. Taylor also discussed the Society's continuing activity in light and vision research, and the need for greater dissemination of lighting knowledge and technology beyond the confines of the Society's own membership.

Nevin Weiss, consulting engineer with Whitman, Requardt & Associates, Baltimore, gave a slide-illustrated talk on "Considerations in Lighting and Wiring the New Social Security Administration Building" which is scheduled for completion early this fall. The nature of the visual tasks on this project—lighting large expanses of files area—required both high quality and high level illumination, Mr. Weiss said, which led to the selection of low brightness 40-watt T17 fluorescent lamps in aluminum reflectors. Power for this lighting was supplied at 480/277 volts in the interest of electrical distribution economy.

The often neglected "Aesthetic and Psychological Aspects of Lighting" was authoritatively discussed by George W. Clark, of Sylvania Electric Products Inc., Wheeling, W. Va. The tendency of engineers is, quite logically, to direct their efforts toward engineering considerations, he stated. But color, form, and texture are also important, he said, and urged engineers to consider these factors in lighting design, and to work more closely with architects and designers in the selection and integration of

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Dr. Ralph K. Witt of Johns Hopkins University, Baltimore, discussed the need for establishing "International Standards and Physical Properties of Plastics," reviewing work which has already been done in this direction. One stumbling block is the problem of finding testing procedures which are satisfactory to all countries involved, he explained. Such standards would be of inestimable value to all users of plastics, including the lighting industry, Dr. Witt said.

W. H. Johnson of Westinghouse Electric Corporation, Cleveland, gave a talk on "High Frequency Operation of Fluorescent Equipment," in which he reviewed the progress in this field since its introduction about 15 years ago, and described and discussed in detail the newest method of frequency conversion—the transistorized frequency converter. This new static converter uses 3-phase, 208-volt, 60-cycle power input, provides single phase, 105-volt rms, 1500-cycle output, and a prototype converter now in operation is rated 1.5 kw, he said. After review of the characteristics and advantages of this new converter, he concluded by pointing out that the new higher lighting levels now being recommended can be economically provided by mating new higher current fluorescent lamps and high frequency operation.

"New Concepts in Residential Lighting" were presented in a color slide-illustrated talk by Miss Kaye Leighton of Nela Park, General Electric Co. Lamp Department, Cleveland.

A symposium concluded the technical sessions of this conference, and was participated in by four panelists. E. A. Linsday of General Electric Co., Nela Park, presented "Concepts of Lighting Today and Tomorrow," and used color slides to show examples of lighting in the home, in industry, and in commerce in which the new IES illumination level recommendations are already exceeded. Willard Allphin, in charge of illumination research of Sylvania Electric Products Inc., pointed up the need for better lighting equipment and lighting system design in providing the new IES recommended lighting levels in a discussion of "Cautions in New Lighting Advances." Berlon C. Cooper, associate editor of *Electrical Construction and Maintenance*, pointed out that the new IES lighting level recommendations are, in general, conservative, and that many lighting customers have already been buying and installing lighting systems which meet the new levels, in his discussion of "Are the New IES Lighting Levels Now Practical?" George J. Taylor, IES President, summarized for the symposium panel. A question-and-answer period followed, with audience participation.

A highlight of the Baltimore Conference was the Regional runoff of the MMILJ (My Most Interesting Lighting Job) contest, which was participated in by the IES Section winners from the East Central Region. This contest was in two parts—Part I on Residence Lighting, and Part II on Commercial and Industrial Lighting.

In the Residence Lighting division, S. Ehrlich of the Maryland Section won first prize on his presentation of lighting a residence, using the lumen counter method of lighting design. Second prize went to Ben Goodman of the Capital Section for his entry, covering a garden lighting exhibit in the Armory, Washington, D. C. Third prize went to Jack Laughner and W. H. Roll (joint entry), of the Pittsburgh Section, for their entry covering "Good Lighting and the Home Builder," or the lighting of a Shoals Prefab House in Butler, Pa.

Winners in the Class II division were as follows: First prize was won by Armand Zatelli, Pittsburgh Section, for his entry covering lighting for a Social Club Meeting Room, American Legion Post No. 5, Pittsburgh. Second prize went to Paul F. Kyack, Philadelphia Section, for his entry covering lighting in the Church of the Nazarene, Pitman, N. J. Third prize was won by Albert A. Fox and Mark Harris (joint entry), Capital Section, for their entry covering lighting of the School of Foreign Service, Walsh Memorial Building, Georgetown University. Also competing was Leo Ratherman, Maryland Section, with an entry covering the lighting of the Auditorium in the General Electric Appliance warehouse, Baltimore.

The Asheville Conference

Second of the IES spring regional conferences was held at Grove Park Inn, Asheville, N. C. It was a joint conference of the Southcentral and Southeastern Regions of the Society, and was held April 22-24th. More than 150 members and guests registered.

IES President George J. Taylor addressed the group at the President's Luncheon, during which he

reported on the effects of new lighting data which resulted from an eight-year study recently completed by Dr. H. R. Blackwell at the University of Michigan, and urged a continuing effort at dissemination of lighting knowledge being made available by the Illuminating Engineering Society.

C. L. Crouch, IES Technical Director, discussed the "Illuminating Engineering Research Institute's Program" and the light and vision studies being conducted under this program which is sponsored by the Illuminating Engineering Society.

A highlight of the conference was an evening session in which E. A. "Red" Linsday, General Electric Co., Nela Park, gave a slide presentation on "Reaching for the Sun—1958 Lighting Progress Report." Light is not just to see by, but to live by, he said. He pointed out a need for still better lighting, then cited new materials, sources, luminaires, installations and new concepts of lighting as the step-ladder to better illumination.

A variety of lighting subjects were covered in the various technical sessions. These included "High Frequency Lighting Power Sources," by W. H. Johnson, Westinghouse Electric Corp., Cleveland; "Engineered Architectural Lighting," by Jack Holzinger, Rambusch Decorating Co., New York City, and related to lighting in churches, banks, auditoriums, and similar public buildings wherein lighting systems and lighting equipment were carefully integrated with the building structures or decorations; "Outdoor Applications of High Intensity Fluorescent Lamps," by W. P. Lowell, Jr., Sylvania Electric Products Inc., in which he stated that the light output per lamp has increased to the point that high intensity lamps are now practical for outdoor lighting; "Challenges in Outdoor Lighting," by W. E. Schwanhausser, of General Electric Company's Outdoor Lighting Department, Hendersonville, N. C., in which he stressed the need for better lighting of streets and highways, to help reduce the high nighttime accident rate; "Lighting and Color," by Miss Jan Reynolds, home lighting and color consultant for Sylvania Electric Products Inc., who pointed out that color in lighting is making equally notable strides as in autos, clothes, home interiors, etc., and that lighting is more than an "accessory"—it's an integral part of the home; and "Dimming Incandescent and Fluorescent Lamps," by R. A. Langer,

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chief engineer for Kliegl Bros. & Co. Inc., New York City, who reviewed the progress of light dimming devices over the past several years, and discussed and demonstrated the latest development in this field, the silicon controlled rectifier dimmer that was first announced earlier this year (*EC and M*, January 1959, pp 159-160).

In the MMILJ IES Lighting Competition there were two sets of contestants for Regional honors, this being a joint Regional conference for two IES Regions. In the South Central Region there were four contestants, and in the Southeastern Region there were nine contestants.

Southeastern winners were Mrs. Sara Perkins of Atlanta, for residential lighting in her own home, and L. R. Bush, consulting engineer, also of Atlanta, for commercial lighting, involving the floodlighting of the Georgia State Capitol Building.

Robert E. Fawcett, with General Electric Co. in Hendersonville, won second place in the commercial division of the contest for his work in the lighting of the Grand Coulee Dam in Washington State.

South Central Region winners were Mrs. Edna Fortier of New Orleans, La., in the residential lighting classification for the lighting which she planned for the residence of Mr. and Mrs. Harold Newman in New Orleans, and Charles E. Strahan Jr., of Jackson, Miss., in the commercial lighting category, for the relighting of the Heidelberg Roof, a dinner club.

Runner-up contestants and their lighting entries were as follows: For the Southeastern Region—Frank Yanaros, Miami, Fla., Southeast Office Building of the Florida Power and Light Co., Miami; T. Lew Cordle, Charlotte, N. C., Lighting for Attraction, Sales, Promotion, of the J. N. Pease & Co. Building, Charlotte; Barney P. Best, St. Petersburg, Fla., St. Petersburg Beach Municipal Building; Si Bell, Sarasota, Fla., Sohji Model Home, Sarasota, Fla.; Paul C. Butler, Light for Living in a Low Cost Home; and Betty Clark, Miami, Miami Shores Outdoor Garden; For the South Central Region—George C. Schroeder, Jr., New Orleans, La., "Mr. Louie" off-shore drilling rig; and Charles D. Hooper, The Sultan's Club, Par Towers.

First prize winners in all regional contests qualify for the final runoff, to be held at the IES National Technical Conference in San Francisco, September 7-11, 1959.

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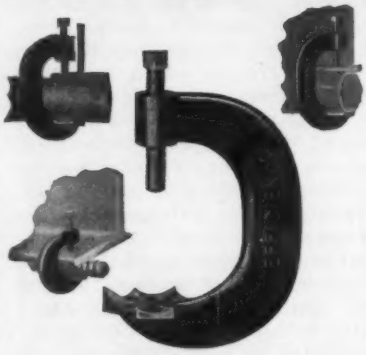

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NISA News

The fall meeting of the Southwestern Chapter of the National Industrial Service Association will be held in Houston, Tex. on September 17-19 at the Shamrock-Hilton Hotel. NISA member shops in the state's largest city include American Armature Works, Glynn Electric Co., T. E. Greve Electric Co., Houston Armature Works, Miller Armature Works, Payne Electric Works, Inc., Shumberg Electric Co., Texas Armature Works.

• • • •

New associate members of the Southwestern Chapter include A. L. Jordan, Anaconda Wire & Cable Co., Tulsa, Okla.; and W. I. Wynn, SECO Electric Supply Co., Dallas, Texas. A new active member is Childress Armature & Machine Works, Childress, Texas.

• • • •

A golf-and-dinner meeting was held May 6 at Westborough Country Club by members of the St. Louis Chapter of NISA and their wives. Among the guests was staff engineer Arthur C. Roe of the organization's headquarters.

• • • •

Simplified blackboard explanations and diagrams of reactors and magnetic amplifiers were explained to members of the Chicago Chapter by E. J. Ther of Ther Electric & Machine Works, Chicago, at the chapter's meeting on April 14 at Graemere Hotel.

• • • •

Matthew Nau, a former tax collector turned electric motor shop repairman, spoke to members of Connecticut Chapter on the topic of taxes at the group's April meeting at Sleeping Giant Country Club, Hamden, Conn.

• • • •

Puget Sound Chapter met in Tacoma, Wash. on May 5. Speaker was Donald L. Metcalf, sales engineer for Gerrish Co. He discussed transmission drives. The group is actively planning the program of the Pacific Northwest Conference to be held in Seattle in Sept.

• • • •

The 46th quarterly meeting of King Coal Chapter was held at the resort lodge of C. W. Nunn, Kentucky Lake, Kentucky, April 11. New officers elected were: President, Ralph Fuhrmann; vice-president, George Byars; secretary-treasurer, John E. Bertges. The group plans to meet in Cape Girardeau, Mo. on July 9; in Marion, Ill. on October 8; in Centralia, Ill. on January 14; and at Mr. Nunn's lodge on April 27.

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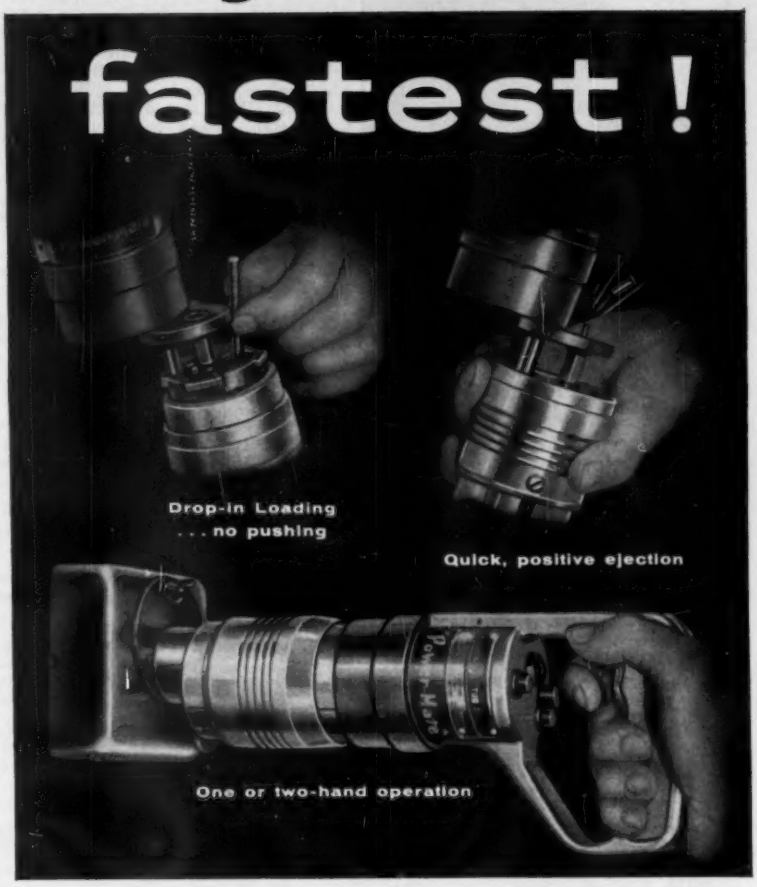

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DATES AHEAD

International Association of Electrical Inspectors—Northwestern Section, Hotel New Washington, Seattle, Wash., Aug. 24-26; **Southwestern Section,** Flamingo Hotel, Santa Rosa, Calif., Aug. 31-Sept. 2; **Eastern Section,** Essex and Sussex Hotel, Spring Lake, N. J., Sept. 14-16; **Canadian Section,** Queen Elizabeth Hotel, Montreal, Quebec, Canada, Sept. 25-26; **Western Section,** Schroeder Hotel, Milwaukee, Wis., Oct. 5-7; **Southern Section,** Heidelberg Hotel, Jackson, Miss., Oct. 12-14; **Mississippi Chapter,** Heidelberg Hotel, Jackson, Miss., Oct. 12-14.

Illuminating Engineering Society—Regional Conferences; **Canadian,** Chateau Laurier, Ottawa, Ont., (Canada), June 11-12; **Great Lakes,** Statler Hotel, Buffalo, N. Y., June 22-23.

New York State Association of Electrical Contractors and Dealers—60th Annual convention, Whiteface Inn, Lake Placid, N. Y., July 7-10.

International Association of Electrical Leagues—El Cortez Hotel, San Diego, Calif., Week of August 10.

Western Electronic Show & Convention—Cow Palace, San Francisco, Calif., August 18-21.

Illuminating Engineering Society—National Technical Conference, Fairmont Hotel and Mark Hopkins, San Francisco, Calif., September 7-11.

Canadian Electrical Manufacturers Assn.—15th annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 30, October 2.

Florida Association of Electrical Contractors—Annual convention and 7th Electrical Trade Show, Robert Meyer Hotel, Jacksonville, Fla., October 7-10.

11th Biennial Electrical Industrial Exposition—Sponsored by Essex Electrical League; Armory, Elizabeth, N. J., October 10-12.

National Electronics Conference—Sherman Hotel, Chicago, Ill., October 12-14.

Electrical Progress Show—Sponsored by Electrical Association of Philadelphia, Convention Hall, Philadelphia, Pa., October 13-15.

National Electrical Contractors Association—Annual convention and 5th National Electrical Exposition,, Fontainbleau, Eden Rock, Deauville and Carillon Hotels, Miami Beach, Fla., November 9-12.

National Electrical Manufacturers Assn.—Annual meeting, Traymore Hotel, Atlantic City, N. J., November 9-13.

Industrial Electric Exposition—Sponsored by Electrical League of Western Pennsylvania, Penn-Sheraton Hotel, Pittsburgh, Pa., November 17-19.

American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., January 31-February 5, 1960.

16th Annual National Wiring Sales Conference—Warwick Hotel, Philadelphia, Pa., February 25-26.

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Headquarters Announcements

Smithcraft Corp. is new name of **Smithcraft Lighting,** Chelsea, Mass.

Master Power Corp. has been formed as a subsidiary of the **Black & Decker Mfg. Co.,** Towson, Md., through the acquisition of the **Master Pneumatic Tool Co., Inc.,** Bedford, Ohio, and **Master Pneumatic Tool Ltd.** of Toronto, Ontario, Canada.

Federal Pacific Electric Co. has transferred its Pacific Switchgear Division operations from San Francisco to Santa Clara, Calif.

Anaconda Wire and Cable Co., New York, has purchased the **Sequoia Wire and Cable Co.,** Redwood City, Calif. It will operate as a wholly-owned subsidiary.

Leece-Neville Co., Cleveland, Ohio, has purchased the **A. C. Motor Division of the O. A. Sutton Co.,** Wichita, Kans.

Arrow-Hart & Hegeman Electric Co. has been granted the nonexclusive right and license to manufacture and market switches under the Touchette patent owned by **Rodale Mfg. Co., Inc.**

Robertshaw-Fulton Controls Co., Richmond, Va.—Robert J. Peck, district sales manager for electrical controls, Indiana Div.; Richard S. Reynolds, Jr., chairman of the board of directors.

Sylvania Lighting Products, New York—Leslie E. Innis, manager, equipment manufacturer sales; Myles S. Gaythwaite, director of marketing—fixtures.

I-T-E Circuit Breaker Co., Philadelphia, Pa.—John P. Bennett, manager of marketing research; Joseph P. Wood, power equipment consultant.

Moloney Electric Co., St. Louis, Mo.—M. B. Mallett, vice president in charge of commercial application.

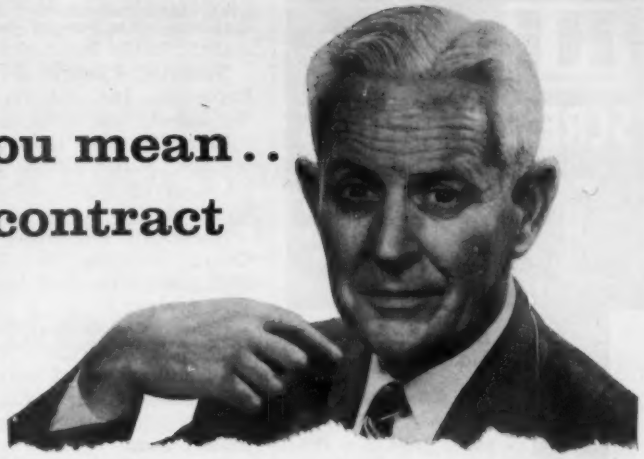
United States Rubber Co., New York—Howard K. Norris, production manager, mechanical goods division.

William Brand & Co., Inc., Willimantic, Conn.—Charles R. Riordan, director of sales.

Scranton Cellomatic Battery Corp., Archbald, Pa.—George E. Knipe, manager of industrial sales.

Stromberg Time Corp., Thomaston, Conn.—William E. Carlson, manager of marketing; Raymond Gooley, plant superintendent.

Electric Storage Battery Co.,



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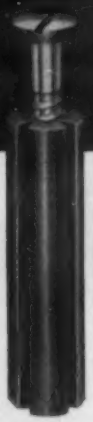

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Buchanan Electrical Products Corp., Hillside, N. J.—George Ustin, vice president in charge of engineering.

Omark Industries, Inc., Portland, Ore.—Edward P. Skralskis, general manager of operations.

Peerless Electric Co., William M. Gelvin, sales engineer, Fan and Blower Div.

General Electric Co., Schenectady, N. Y.—Seymour Krewitsky, manager, heating control and special purpose shop operations, Appliance Control Dept.

Sangamo Electric Co., Springfield, Ill.—Hugh W. Griffith, Jr., sales manager, power equipment.

Wolverine Tube, Div. of Calumet & Hecla, Inc., Allen Park, Mich.—Howard J. Luetzow, technical sales representative.

Beaver Pipe Tools, Inc., Warren, Ohio—Russell Herig, vice president of sales.

Edwards Co., Inc., Norwalk, Conn.—Robert L. Kempton, vice president in charge of marketing.

Anderson Electric Corp., Birmingham, Ala.—Melvin D. Henry, sales application engineer, Distribution Division.

Silvray Lighting, Inc., Bound Brook, N. J.—Charles S. Schwartz, head of new consumer division.

John C. Virden Co., Cleveland, Ohio—Kim Moe, vice president, manufacturing.

Moe Light Div., Thomas Industries Inc., Louisville, Ky.—Edward G. Bohler, merchandise manager.

Electric Auto-Lite Co., Toledo, Ohio—Edwin R. Stroh, vice president and director of sales.

Holophane Co., Inc., New York—Clarence C. Keller, executive vice president.

FWD Corp., Clintonville, Wis.—Hubert McCarthy, head of new market and distribution research department.

Reliance Electric & Engineering Co., Master Electric Div., Dayton, Ohio—Nicholas J. Bova, Albert F. Fehrman and Roy M. Sigritz, superintendents of winding, mechanical and finishing departments, respectively; Robert C. Koenig, production manager; John F. Kruse, chief industrial engineer.

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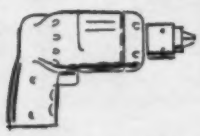

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Regional Appointments

NEW ENGLAND

Moe Light Div., Thomas Industries Inc.: Donald Abwender, northeastern division sales manager.

Ohio Brass Co.: Otto Price, Jr., district manager, New England territory, covering Connecticut, Massachusetts, Rhode Island and Vermont.

MIDDLE ATLANTIC

International Rectifier Corp.: John A. Staluppi, manager, New York City branch office.

Electro Lighting Corp.: David Rowe, district manager in South Plainfield, N. J., for northern New Jersey.

Wolverine Tube, Div. of Calumet & Hecla, Inc.: John W. Baker, technical sales representative in Philadelphia; L. A. Brewer, sales representative in Rochester, N. Y.

Edwards Company: John J. McGowan, New York district manager.

Toledo Pipe Threading Machine Co.: James H. Birch, sales manager, Eastern Division.

Utility Transformer & Equipment Co.: William J. Waldron, sales representative in Metropolitan New York City and state of New Jersey.

Pittsburgh Standard Conduit Co.: James D. Logan, eastern regional sales manager, New York City.

Lewis-Shepard Products, Inc.: James A. Melville, sales and service representative, Pittsburgh territory.

Lamson Mobilift Corp.: Duncan E. Hill, Jr., Eastern Regional manager, Long Island City, N. Y.

Sylvania, Lighting Products: Joseph M. Root, sales supervisor in Philadelphia district.

SOUTH ATLANTIC

Electro Lighting Corp.: Thomas A. Marshall, district manager in Fort Lauderdale, Fla., for southern Florida.

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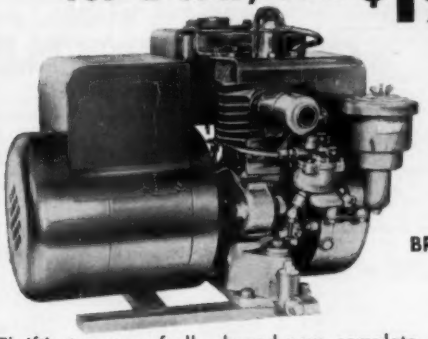

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Belden Mfg. Co.: Wayne Hernly, district sales manager, Southeast Central District.

I-T-E Circuit Breaker Co.: Walter S. Caldwell, utility apparatus engineer, southern sales region.

EAST CENTRAL

Miller Company: Richard J. Slattery, agent in Cincinnati-Dayton territory; George R. Patterson, representative in Memphis-Little Rock area.

Electro Lighting Corp.: Donald D. Jones, Peoria, Ill., district manager for South Central Illinois; Charles C. Koerner, St. Louis, Mo., district manager for Southern Illinois and Northern Missouri; Edmund Wood, Indianapolis, Ind., district manager for Indiana.

Toledo Pipe Threading Machine Co.: Blake M. Wilson, sales manager, Central Division.

Anderson Electric Corp.: James J. Stenger, sales representative in Ohio.

Thomas Industries Inc.: Jerome T. Kurth, sales representative for lighting fixture division in Chicago metropolitan area.

Edwards Company, Inc.: A. B. Thomas, assistant central regional manager; P. D. Sweeney, Chicago district manager.

WEST CENTRAL

Miller Company: Tom Bjorge Sales Co., agents in Iowa-Nebraska territory; Herman Garrett, representative in Lubbock, Amarillo, Abilene, San Angelo, Midland, Odessa and El Paso areas, all in Texas.

Okonite Company: James R. Haden, district manager of new Kansas City district office; Thomas M. Brickley, Jr., manager of new Milwaukee district office.

Allis-Chalmers Mfg. Co.: J. E. Despins, manager, Mexico district.

WEST

Miller Company: Richard C. English, representative in Washington, Oregon and Alaska.

S&C Electric Co.: Ted Palmer, manager, Western Sales Div., headquarters in Burlingame, Calif.

Day-Brite Lighting, Inc.: Carl L. Powell, general manager, Western Division.

Toledo Pipe Threading Machine Co.: C. E. Hartsing, sales manager, Western Division.

RIGID *Conduit* PIPE NIPPLES

IN STOCK
½" to 6" sizes
close to 12" long
HOT DIP GALVANIZED
Also available in wrought iron or aluminum

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WHERE TO BUY

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IDENTIFICATION NAME PLATES

Machine engraved on black bakelite with white lettering—any titles—for controls, panels, etc. Quick mail service any distance. Send for free sample and prices.

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THIS WHERE TO BUY SECTION . . .

is a special classification for manufacturers desiring advertising in space units smaller than the minimum run of book display space. Space is available in this section in units from one to four inches. Every advertisement is indexed. This section can be used economically to promote new product users and uses, establish new sales outlets, reach the buying influences — at an extremely low cost.

MEDALLION REWIRING

[FROM PAGE 105]

area. In addition there is a pull-down fixture mounted over the dinette table that matches an identical fixture in the family room. In the dining room an outdated 5-lite, bare-lamp lighting unit was replaced with a beautifully decorated all-brass modern pull-down type fixture. Fluorescent bracket lights mounted on each side of a new mirrored medicine cabinet in the upstairs bathroom are used to replace an old existing ceiling fixture. The new bracket lights provide the correct amount of light where it is needed most for shaving and applying facial cosmetics. Yard lighting in the form of a cluster of outdoor floodlights installed under the eaves at the rear of the home illuminate the backyard and the sidewalk to garage.

The full extent of Reinicke Electric's rewiring job is realized more in the all-electric kitchen than in any other part of the house. Power from the new service entrance properly channeled and distributed runs a maze of electrically operated appliances. (See sketch for detailed kitchen wiring plan.) The all-electric appliance installation includes: two built-in electric wall ovens, six built-in electric cooking surface units, an automatic washer and electric dryer, under-counter dishwasher, waste disposer, refrigerator-freezer, range-hood ventilating fan and a built-in mixer-blender with knife sharpener, juicer and food grinder attachments. The well planned, high-capacity electrical system makes it possible to use all of these electrically operated appliances at the same time and get peak performance from each one. There is no need to postpone a laundry chore or cooking task in order to accomplish one or the other.

Many residential rewiring jobs may not be as comprehensive as the one described here. However this residential modernization job should prove that there are tremendous opportunities in this field. Excellent results can be achieved in bringing older type homes up to date in electrical convenience and livability, but only by proper planning, promoting and selling can these results best spell satisfied customers and increased profits.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

DISPLAYED —RATES—	UNDISPLAYED
Employment Opportunities—$24.00 per inch, subject to Agency Commission.	$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Equipment & Business Opportunities—$17.00 per inch, not subject to Agency Commission.	*Position Wanted ads* take one-half of above rate.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.	*Box Numbers* in care of our New York, Chicago & San Francisco offices count as one additional line.
Equipment Wanted or For Sale Advertisements acceptable only in Displayed Style.	*Discount of 10%* if full payment is made in advance for 4 consecutive insertions.

Send New Ads to Classified Advertising Div. Electrical Construction & Maint. P.O. Box 12, New York 36, N.Y.

KAISER ALUMINUM

Full line Electrical Conductor Division of Kaiser Aluminum offers position as:

ELECTRICAL WIRE AND CABLE PROJECT ENGINEER

Position: Responsible for insulated product contacts with utilities and large industrials. Lend technical assistance to customers on problems involving the application or use of insulated wire and cable. Assist in disseminating technical information to the field.

Qualifications: Requires thorough knowledge of use of insulated wire and cable products by utilities and large industrials. Must have electrical engineering degree and five to ten years' cable engineering, sales, and utility experience.

Please reply in full, stating age, education, background, salary requirements, and experience to:

T. W. Dwyer
KAISER ALUMINUM & CHEMICAL CORP.
P. O. Box 671 **Newark, Ohio**

TRANSFORMERS

BOUGHT — SOLD — RENTED
REWOUND — RE-DESIGNED
MANUFACTURED

Ask For Our Price Schedule And Stock List

THE ELECTRIC SERVICE CO., 5322 Hetzel St., Cincinnati 27, Ohio

"America's Exclusive Independent Transformer Service Shop"

Your inquiry will have Special value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertisers wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

ELECTRICAL ENGINEER

Recent graduate with up to two years experience. Supervise and coordinate electrical maintenance, installations, and design in a large pharmaceutical manufacturing firm which has been continuously expanding.

Position is challenging and interesting, with excellent opportunity for advancement.

Reply, giving full particulars, to:

D. V. Vines
Personnel Manager
CHAS. PFIZER & CO., INC.
Groton, Connecticut

BUSINESS OPPORTUNITY

Wanted; Associate for fast growing Electrical Contracting firm in Southern California. BO-1533, Electrical Construction & Maintenance.

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CLASSIFIED ADVERTISING
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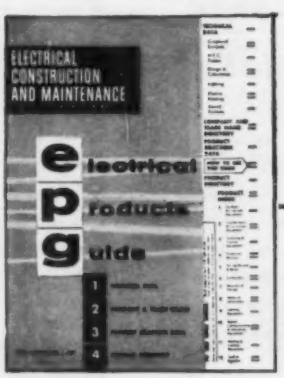
For Sale 207



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

EXACTLY THE PANELBOARD YOU WANT

Right Off Your Square D Distributor's Shelf!

In our contracting business, we find QMB PANELBOARDS are just the thing for heavy industrial jobs. The switches are heavy-duty horsepower rated and they plug in just like plug-in duct units or drawout air circuit breakers. The switch unit I'm holding is a twin 60 ampere 3-pole unit, rated 600 volts. We picked up the entire panelboard this morning from our local Square D distributor's stock to use on a 480 volt job. *We'll have it installed and wired by tomorrow afternoon—and no overtime.*

Notice that this 240 volt switch is much smaller than the 600 volt unit. That means we can put more circuits in the same size panelboard. Since Square D started making these new smaller units, we've been using QMB on all our commercial jobs. The interiors and boxes are the same for both 240 and 600 volt panelboards. That means one stock can work for both. *We can get the complete panelboard from our local Square D distributor the same day the job develops.*

We don't gang separate safety switches and motor starters over a trough any more. The new QMB MOTOR STARTER PANELBOARD makes a much cleaner job. It's easier to install, it costs no more, and it's in our distributor's stock. In our business, we're concerned with overall installed costs. We find the installed cost of the QMB STARTER PANELBOARD is no greater than that of separate components. The interlock between the switch and starter doors makes a much safer installation, too.

• Plug-in construction combined with heavy-duty industrial design has made the QMB PANELBOARD a tremendous success. In fact, the flexibility of this unit plus availability from distributor stocks, has made it the leading power panelboard on the market. It's available either in 600 volt or 240 volt construction. Motor control units are available for use with either voltage switch units. When switch units exceed 200 amperes, the panelboards can be obtained from the nearest Square D Assembly Plant, completely factory-assembled. It's the modern fusible standard.

For additional information
write Square D Company, 6060 Rivard Street, Detroit 11, Michigan

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

NEW . . . by CROUSE/HINDS

ARK-trol®

ELECTRICAL CONNECTORS

• Foolproof polarization • Errorless assembly • Maximum interchangeability • Environmental: Exceed rigid military and industrial requirements for resistance to corrosion, chemicals, high and low temperatures, pressure, shock, vibration, dust, humidity, moisture, and leakage of air.

POSITIVE POLARIZATION

Completely foolproof: plug can be mated only with proper receptacle, and in only one way . . . the *right* way. Unsymmetrical contact arrangements preclude improper mating of contacts, or mating of unmatched contact configurations.

FAST, EASY, ERROR-FREE ASSEMBLY

Polarization keyways and unsymmetrical contact arrangement in insert assemblies make improper assembly of parts impossible. One-piece 'snap-in' connectors. Soldering is done outside . . . *before* insertion of contacts.

SEALED AGAINST ENVIRONMENTAL FACTORS

'Stack' assembly includes silicone rubber wafer for impenetrable seal against water, vapors, dust, gas. Basic shells, other metal parts are high-strength extrusions of aluminum alloy, anodized for corrosion, abrasion resistance: 1800 volts are required to penetrate this coating.

MAXIMUM INTERCHANGEABILITY

Components in each diameter are interchangeable and reversible, doubling scope of equipment. Male *and* female shells take either pin or socket inserts: both plug and receptacle may be used 'hot' or 'dead'. Pin and socket configurations available in wide range . . . specials supplied on request.

SHELL SIZES and ELECTRICAL RATINGS

Four shell sizes: from 1-1/16" to 2-9/16" diam. *Voltages:* Military Service Ratings: A, D, E, B, C and Instrument. NEC Rating: 600V. A.C. *Contact sizes:* #16 to #4/0 inclusive. Write for Bulletin 2711 containing complete descriptions, specifications and configuration patterns for both Type RPE and RPC *ARK-trol* Electrical Connectors.

Available in two types:

TYPE RPE ENVIRONMENTAL

- Moisture Proof
- Shock Insulated
- Dust-Tight
- Corrosion Resistant
- Grounded & Non-Grounded

TYPE RPC CIRCUIT BREAKING

- All Features of RPE *Plus* . . .
- Circuit Breaking under full Rated Load

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SYRACUSE NEW YORK

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